

Maryland Energy Administration

Maryland Industries of the Future Report:
Industry Selection, Energy Characterization,
and Needs Assessment

January 21, 2003

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1. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The Industries of the Future (IOF) program is a U.S. Department of Energy (DOE) effort to boost resource productivity in nine energy and resource intensive industry subsectors: Agriculture, Aluminum, Chemicals, Forest Products, Glass, Mining, Metal-Casting, Petroleum Refining, and Steel. Maryland's Department of Energy Administration has a partnership with DOE's Office of Energy Efficiency and Renewable Energy to deliver the resources of the national IOF program to the State of Maryland, with the objective of expanding these opportunities to a larger number of partners and reach those businesses and manufacturers that have not been involved in the national IOF effort.

As a first step in the planning process, and to provide baseline information as the Maryland IOF program starts up, the Department of Energy Administration commissioned a study with three objectives: to select key Maryland industrial subsectors that the program should target; to characterize the energy consumption and energy efficiency habits of Maryland industry; and to assess the needs and interests of industry to access training, best practices and other services to be offered under the IOF program. This was accomplished through a detailed telephone survey of a carefully selected representative sample of Maryland industrial establishments, carried out in August through October 2002.

The results of the survey provide an interesting view into energy efficiency problems, policies and potentials in Maryland industry. In the sections below, the survey conclusions are grouped into topical areas, where they also lead to recommendations for the IOF program.

Of the nine IOF subsectors, Maryland really only has representation in six: Chemicals, Petroleum Refining, Forest Products, Metal Casting, Steel, Aluminum and Glass. Agriculture and Mining are essentially non-existent. At the same time, the Food Products industry is one of the most populous in the State. As a result, the survey focused on a grouping of six industry subsectors that cover the seven formal IOF sectors and include Food Products:

- Forest Products (including Wood Products and Paper)
- Petroleum Refining
- Chemicals
- Non-metallic Minerals (including Glass and Cement)
- Primary Metals (including Aluminum and Steel, as well as foundries)
- Food Products (including Beverages).

Of the 5039 industrial establishments in the State, 1077 have annual sales of over \$5 million, and represent approximately 75% of the total industrial energy consumption. Targeting the industries which fall into the studied sectors results in a sample of 507 establishments, which provide the basis for the survey described here. These are led by 173 Food Processing plants, 115 Chemicals plants, and 78 Wood Products facilities. Response rate was 15.8% on average, with most subsectors slightly higher, except for Chemicals with a 13.3% response and Petroleum with 8.8%.

1.1 MARYLAND INDUSTRY CHARACTERISTICS

Maryland industry is diverse. The list of equipment and processes is as varied as the list of plants. There is no magic way to aggregate parts of the industrial sector in Maryland to better

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direct information and contact efforts. While there are some subsectors that are hardly represented (Agriculture, Mining), there are no particular trends towards certain types of industries.

Most of the client industries are fairly small. Nearly two-thirds of the industries have annual sales between \$5 MM and \$25 MM, with another 15% up to \$50 MM. However, these sizes are very consistent with average industry sizes throughout the U.S., based on 1997 U.S. Census information. Despite the relatively small sizes, Maryland is dealing with a typical cross-section of U.S. industry. Because of its smaller size, however, the absolute number of large plants is small (there are 28 known plants with sales over \$ 100MM).

Smaller firms were slightly more responsive to the survey. Although the difference is indeed slight (16% higher than would be proportional to the population in the \$5 – 10 MM annual sales category), this trend is also observed when organized by numbers of employees or by plant area, and indicates that small firms might have a greater interest in the topic of energy efficiency.

Maryland industries are either unique, or part of a large corporate network. Nearly half the industries are single-facility operations, while 10% have only one other facility as part of the same company. However, 28% are part of a group of 10 or more facilities under the same company.

Recommendation: The Maryland IOF program should develop a focus on the small and medium-sized industrial plant, offering information on specific equipment common to most plants (lighting, motors, compressors, boilers, steam systems), along with support for best practices activities related to this equipment.

1.2 ENERGY EFFICIENCY POTENTIAL

All signs point to good potential for cost-effective energy efficiency improvements. Among the examples that support this are the following:

- seemingly low penetration for variable speed drives (VSDs): only 10% of motors below 75 hp and 25% of higher hp motors have them, significantly lower than national averages
- computerized energy management systems exist in only 19% of facilities, and half of these appear to be for manufacturing control; furthermore, only 2.5% of the plants use an EMS for peak demand control, despite time-of-use rates in the State.
- there are very few new installations: on average, buildings and facilities are relatively old, and likely can be replaced by newer, more efficient equipment; almost 84% are at least 11 years old, and 65% are at least 15 years old.

The savings potential appears to be greater on the thermal side. Thermal energy is not as carefully or easily measured and monitored as electrical energy. This is especially true for larger industries which have older installations and a preponderance of thermal energy-using equipment.

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Recommendation: Focus on developing an outreach program to older industries, especially those with large thermal energy consumption. Use information on best practices in the boiler, steam and process heating areas to provide the basis of the outreach program.

1.3 ENERGY MANAGEMENT

Plants are aware of but not committed to energy management. 60% of plants have assigned responsibilities for energy efficiency, but only 2/3 of those (less than half the total) have actual budgets assigned. While nearly 2/3 track energy costs for their facility, slightly less, just more than half, actually identify energy-saving improvements. Similarly, only half have specific energy-saving goals. (The reasons cited for lack of attention to energy management were fairly consistent among all plants, focusing mainly on the low relative importance of energy costs and the many other priorities for staff resources.)

Peak demand does not appear to be a major concern. More than half the plants surveyed do not pay attention to peak demand management.

Audits are fundamental. Companies agree that energy audits are important tools for addressing the energy situation in Maryland industry. In the companies that use them, a 2-year cycle emerges. This is logical and consistent with best practices for identification of energy efficiency measures. However, less than half of the companies admit to have ever had an energy audit, again underlining the potential of this tool to provide useful input to industry. The laggards are Chemicals (nearly _ of facilities have not been audited) and Forest Products (2/3 of the plants have never been audited).

Companies are investing but not in energy. 60% of companies reported projects with capital investments of at least \$10,000 over the last two years, averaging to approximately four projects per company. However, only 20% of these projects were undertaken for energy efficiency reasons. Chemicals led the investments, with an average of over 8 projects per plant over the last two years, although only in about half of the plants surveyed.

The bulk of the decisions are made at the top. The president or CEO, along with production and facilities managers are the key staff involved in Investment projects. In the plants surveyed, such projects were most often recommended by the Production Manager (55%), the Building or Facilities Manager (54%) or the CEO (43%). Approvals by far were by the president or CEO (76%) or by the CFO or comptroller (43%). Only 20-25% of the projects were approved at the production or facilities management levels.

Recommendation: While energy management is not the only focus of IOF, the Program should make sure to include outreach and education on managing energy in a company. Small changes in awareness and the ability to identify projects can make a significant difference in the bottom line. Again, much of this can come from Best Practices programs.

Recommendation: IOF should continue to look for ways to offer or promote the energy audit as a basic building block in the energy efficiency field. It appears that companies who have used it continue to do so, while a good percentage companies are still non-users, and could surely benefit from it.

Recommendation: IOF must find ways to target key high-level decision makers in companies. One approach is to participate in business or management forums that reach these executives.

1.4 KNOWLEDGE AND PERCEPTIONS OF ENERGY EFFICIENCY

Perceptions regarding energy efficiency are remarkably bland. There are no strong opinions and hardly any variation from subsector to subsector. For example, the reaction to the assertion that the company has taken advantage of all the cost-effective savings in energy efficiency was a mediocre 2.8 out of 5. Similarly, the self-rating of plants with respect to their overall energy efficiency performance resulted in only a 5.9 out of 10. In other words, companies admit they're not doing everything they could, and that there are additional savings to be had out there; they're just not too concerned about this. Of the different perceptions surveyed, the assertion that found one of the strongest agreements (3.5 out of 5) was that energy efficiency may be overestimated, that the promised savings may not materialize or be evident on the bill. This may be a justification of the lack of excitement in the other perceptions, or even a bit of sour grapes, although overestimation of savings has been a problem with energy efficiency programs and consultants in the past. Finally, the higher agreement (3.7 out of 5) with the assertion that energy efficiency brings benefits beyond cost savings offers some hope in trying to convince industry to take a second, more careful look at energy efficiency activities.

Efficiency has advantages and disadvantages too. Advantages of energy efficiency equipment are well known and accepted, with no particular concerns. 80% of respondents focused on energy/cost reduction, while better performance and longer life were also mentioned. However, in disadvantages, only 60% cite higher costs or long payback; the remainder comprise a combination of incompatibility with the process, poorer performance and lack of availability.

The response to training opportunities is less than overwhelming. On average, slightly more than half the companies said that training and information would help increase their energy savings. Petroleum and Chemicals were much more negative: if they are eliminated, this number rises to 60% of companies. Only 30% of Chemicals companies considered training and information useful to increase energy savings.

Recommendation: An education and outreach campaign or similar effort seems absolutely necessary to set the record straight and return the concept of energy efficiency to its rightful pre-eminent position in the company. However, such a campaign will not attract the industry's attention as a stand-alone effort; it must be linked with other activities to be useful. The IOF program should use all of its industry-related activities (training, dissemination of Best Practices materials, participation in fora) and other contracts with industry to continue furthering the message, perhaps also through case studies and industry endorsements.

1.5 ENERGY EFFICIENCY PROCUREMENT POLICY

Energy efficiency purchasing policies offer great potential. Only a third of companies claim to have a policy that fosters the purchase of energy efficient equipment, while two thirds simply do not. But of the companies who have a policy, only one admitted to a written set of guidelines; the majority use informal guidelines that are at the discretion of the users. Of those with informal guidelines, only four (14%) specified Energy Star equipment, while about 70% require a financial analysis to confirm the purchase of the higher efficiency product. A full 86.2% of the companies do not mention Energy Star in the equipment procurement policies or procedures. With the support offered by the Energy Star program, and the content of environmental management systems and sustainable development programs that many

1. Summary, Conclusions, and Recommendations...

companies subscribe to, there is no reason that a majority of companies should not implement formal guidelines for the purchase of energy efficient equipment.

Recommendation: IOF should develop a campaign to support the formalization of Energy Star purchasing guidelines in companies. Although the Energy Star beneficiary equipment is more institutional than industrial, all industries buy such equipment. A formal procurement policy might be the first step in a more coherent approach toward energy efficiency, and a way to build broader awareness and support for energy efficiency.

1.6 ELECTRICITY PROCUREMENT

Companies did not appear savvy or concerned about electricity and its price. Only 25% of the companies have recently renegotiated their electricity contract, while 64% have not been offered, or have not pursued, the opportunity of renegotiating it.

Recommendation: This theme offers the IOF program another way to reach industry, focusing on a relatively benign issue such as electricity procurement. Since information is key in this case, and savings potential can reach important sums, the IOF program should be able to offer a useful service to industries by presenting workshops on this theme, perhaps in conjunction with power suppliers.

1.7 INTEREST IN THE IOF PROGRAM

There is average interest in the IOF. While 22.5% of respondents expressed a complete lack of interest, a similar number claimed to be very interested. Over half the respondents, however, were in the middle, asserting to be only somewhat interested.

Over half the respondents, a total of 46, were interested in the IOF Forum. However, only a small fraction of those actually came, despite several invitations.

Recommendation: The Maryland IOF program should follow up with every respondent who expressed a strong interest in the program. If this first hurdle can be cleared, it can be hoped that the participants who go to the Forum will be impressed with the quantity and quality of content and sign on to the program. After the Forum, another effort should be made to invite those interested to the IOF Steering Committee meeting.

1.8 THE CHALLENGE OF THE CHEMICALS PLANTS

It is interesting to note that the survey shows Chemicals plants are consistently and significantly worse than any other industry regarding energy efficiency awareness, operation and performance:

- Chemical plants are lagging behind other industries on energy efficiency responsibilities, with 60% of chemical plants having no one responsible for efficiency (this is 50% more than the average of other plants, twice as high as in non-metallic minerals subsector and three times as high as in the primary metals subsector). (Forest Products is another laggard: nearly half have no one with responsibility assigned for energy efficiency, and only 1 in 15 has a specific budget for energy management; also this subsector has the oldest electrical equipment (motors, compressors) of any subsector. Like in Chemicals, only a

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quarter of plants have energy reduction goals, while in the three other subsectors 2.5 times as many plants claim to have such goals.)

- As previously mentioned, nearly 75 % of Chemicals plants claim never to have been audited, a number almost twice as high as in the other subsectors.
- As previously mentioned, only 30% of Chemicals plants considered training and information useful for energy savings.
- Chemicals sector plants also appeared to be lagging in energy efficiency equipment installation (VSDs, computer energy management), both with respect to the national level for the chemical sector, as well as with respect to other Maryland industries.
- At the same time, Chemicals plants have relatively old equipment, especially on the thermal side, again implying potential benefits to an energy audit undertaking.
- Even the response rate of Chemicals plants was poor: at 13%, the chemical sector has the second lowest response rate of any sector.
- Finally, while an average of 25% of the surveyed plants asserted to be “very interested” in the IOF program, the corresponding number for the Chemicals plants was only 6.7%.
- The great majority of chemical plants are 5-day one-shift operations; 87% operate only 5 days per week, and 73% operate only one shift. This represents almost double the similar numbers for any other industrial subsector. Still, this cannot explain the consistent disappointment that this subsector causes with respect to energy efficiency.

Recommendation: Maryland IOF should focus on the Chemical sector; this may be a place where significant potential exists if the proper contacts are made. While it seems that Chemicals plants are reticent to consider energy efficiency, IOF should develop specific offerings to the Chemicals sector (initially, training, possibly research-related activities) and work to build satisfaction and good will within this important client subsector. In the process, IOF should continue to investigate and discuss with the Chemicals Sector to better understand the tendency of the survey responses.

1.9 CONCLUSIONS

Maryland IOF’s challenge is daunting. The survey results depict an industrial sector that, at best, shows polite interest in energy efficiency. At the same time, it identifies many things to be done: training, developing and increasing industrial awareness and commitment, purchasing new energy efficiency technologies, and setting up internal policies to do it consistently and well. The Program will have to deal with many small to medium-sized industries, a large sum of albeit small individual savings.

Energy audits also appear to be an approach worthy of pursuit, given the large fraction of industries that claim never to have done an audit. And finally, there is the Chemicals sector, which needs everything from audits to awareness in order to take advantage of its great potential for savings. In this case, a combination or integration of energy and process

1. Summary, Conclusions, and Recommendations...

analysis may be a worthwhile and somewhat novel approach, as long as it is focused on the business case for these industries.

Overall, this study provides a baseline snapshot of Maryland industry on the eve of the startup of the Maryland IOF program. It remains available to guide decisions on the evolution and priorities of the Program, and can play an important part in a future monitoring exercise to determine the effects and impacts of the Maryland IOF effort.

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The Industries of the Future (IOF) program is a U.S. Department of Energy (DOE) effort to boost resource productivity in nine energy and resource intensive industry subsectors: Agriculture, Aluminum, Chemicals, Forest Products, Glass, Mining, Metal-Casting, Petroleum Refining, and Steel. Maryland has a partnership with DOE's Office of Energy Efficiency and Renewable Energy to deliver the resources of the national IOF program to the local level. The objective is to expand these opportunities to a larger number of partners and reach those businesses and manufacturers that have not been involved in the national IOF effort. To that end, the Maryland IOF program will also include efforts to support activities in the Food Processing subsector, an important industry in Maryland.

"The mission of the Maryland Industries of the Future Program is to assist Maryland industries in saving energy, reducing waste, and increasing productivity by providing resources and information and through building partnerships."

The Maryland Industries of the Future Program brings together industry, academia, and state agencies to address the important energy issues confronting industry in the state. These public-private coalitions facilitate industry solutions locally and enhance economic development throughout the state. The Maryland program will focus on two areas to increase competitiveness through energy efficiency. The first area of emphasis is based on the delivery of education and information for energy efficiency improvements in the near term, using existing proven technologies and best practices. The second component of the program will seek to leverage corporate interests and resources and research university excellence to obtain federal funding for research and development projects related to industrial energy efficiency improvement.

The Maryland IOF program is funded by a grant from DOE and by the State of Maryland through the Maryland Energy Administration (MEA), the implementing agency for this program. The Maryland Department of Business and Economic Development is partnering with the MEA on this program and will be contributing to the development of training and educational programs.

The objectives of the Maryland IOF Program are:

1. Develop and deliver technical resources on energy efficiency to Maryland industries.
2. Increase the level of research and development funding dollars to address the needs of Maryland manufacturers.
3. Establish university partnerships to support Maryland manufacturers.
4. Hold an annual event to communicate industry's energy needs to state government and to promote the Maryland IOF program.

Key benefits of a successful IOF program in Maryland include: efficiency and competitiveness improvements in industry; increased research and development funds for important industries; and greater industry-to-industry and industry-to-government communication, all leading to strengthening the sustainability of this important sector.

2. Introduction...

To lay a strong foundation for the IOF program, MEA's first task is to characterize Maryland industry in energy and energy efficiency terms, and use this understanding to develop the program strategy and specific activities.

This report describes the results of an industrial survey, site visits and data analysis carried out to develop an energy picture of Maryland industry. The effort described here focused on three primary tasks:

Development of assessment criteria and industry selection: Maryland business and manufacturing statistics were analyzed to identify the industrial sectors of greatest importance to the Maryland economy and those that are the most energy-intensive. This first step established the target industrial sectors, and developed size thresholds to target specific companies.

Energy characterization: A detailed survey questionnaire was used to probe into the energy uses of the targeted industrial facilities within the State.

Needs assessment: Specific lines of questioning were applied in the survey to determine awareness, priorities and needs regarding energy consumption and energy efficiency in the industry.

Together, the results of these three tasks provide a database of Maryland industry performance, problems and needs. More importantly they offer a framework and a list of priorities for the Maryland IOF program.

Chapter 3 describes the criteria used to identify the desired industrial subsectors, and the results of that selection process. Chapter 4 explains the methodology of collecting additional data from the target sectors and industries, while Chapter 5 describes the results of this data collection and analysis. Chapter 6 summarizes the most important of these results in the context of the IOF program, draws conclusions and presents recommendations for the program.

2.3. ASSESSMENT CRITERIA AND INDUSTRY SELECTION

2.13.1 INTRODUCTION

This chapter presents our recommended selection criteria for targeting Maryland IOF participants. A combination of criteria was used. Economic energy intensities were used to identify potential industrial subsectors. These energy intensities were then applied to the database of Maryland businesses maintained by the Department of Business and Economic Development (DBED). Finally, revenue figures were used to narrow our focus and to identify individual companies. Ultimately, the target sample was defined by energy intensive subsectors having 10 or more companies with annual revenues above \$5M. As a result, we recommended that the following targeted subsectors based on NAIC codes (the corresponding IOF subsectors are noted in parentheses) be included in the industry assessment study:

- 311 – Food (Food Processing)
- 312 – Beverage and Tobacco Products (Food Processing)
- 321 – Wood Products (Forest Products)
- 322 – Paper (Forest Products)
- 324 – Petroleum and Coal Products (Petroleum)
- 325 – Chemicals (Chemicals)
- 327 – Nonmetallic Mineral Products (Glass, also includes Cements)
- 331 – Primary Metals (Aluminum, Steel, Metal Casting)

2.23.2 ECONOMIC ENERGY INTENSITIES

To identify the most energy intensive industrial subsectors, we consulted the Energy Information Administration's 1998 Manufacturing Energy Consumption Survey (MECS). Economic energy intensities (consumption of energy per employee, dollar of value added, and dollar of value of shipment) for the South Census Region (Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia) are shown in Table 3.1. These are the latest figures available, as the 2002 MECS will not be fielded until Spring 2003. The MECS survey covers all industrial establishments with 2-digit NAICS codes 31-33 and includes all IOF subsectors except Agriculture and Mining.

The most energy intensive subsectors in terms of energy consumption per dollar of value of shipments are highlighted in the table. Textile Mills, Forest Products (Wood Products & Paper), Petroleum & Coal Products, Chemicals, Nonmetallic Mineral Products, and Primary Metals all consume at least 2,500 Btu for every dollar of product they ship.

Table 3.1
Energy Consumption Ratios, U.S. South Region

NAICS Code	Subsector and Industry	Consumption per Employee (million Btu)	Consumption per Dollar of Value Added (thousand Btu)	Consumption per Dollar of Value of Shipments (thousand Btu)
311	Food	577.1	4.7	2.1
312	Beverage and Tobacco Products	771.9	1.1	0.8
313	Textile Mills	773.9	12.2	4.8
314	Textile Product Mills	359.8	5.0	1.9
315	Apparel	87.5	1.9	0.9
316	Leather and Allied Products	67.3	1.0	0.6
321	Wood Products	1,279.5	20.1	7.3
322	Paper	8,152.0	59.8	27.5
323	Printing and Related Support	142.2	1.9	1.1
324	Petroleum and Coal Products	46,448.3	160.5	30.3
325	Chemicals	8,150.2	27.7	14.6
326	Plastics and Rubber Products	416.6	4.6	2.3
327	Nonmetallic Mineral Products	2,183.1	20.8	11.8
3272	Glass and Glass Products	1,905.2	14.6	9.5
327310	Cements	23,573.6	103.6	62.3
331	Primary Metals	4,506.5	41.0	15.1
331111	Iron and Steel Mills	10,942.0	66.6	27.6
3312	Steel Products from Purchased Steel	655.5	8.0	2.9
3313	Alumina and Aluminum	6,665.5	55.1	15.9
3315	Foundries	906.0	12.2	6.8
332	Fabricated Metal Products	236.3	3.0	1.6
333	Machinery	128.9	1.3	0.7
334	Computer and Electronic Products	121.6	0.7	0.4
335	Electrical Equip, Appliances, and Components	261.5	2.2	1.1
336	Transportation Equipment	228.7	2.0	0.7
337	Furniture and Related Products	118.9	2.1	1.1
339	Miscellaneous	226.5	2.7	1.7
	Total	1,660.0	14.0	6.6

Source: 1998 Manufacturing Energy Consumption Survey, Energy Information Administration, US Department of Energy

2.33.3 ANALYSIS OF DBED DATABASE

Table 3.2 reports the number of Maryland industrial businesses in the database maintained by DBED. The database contains no Agricultural establishments and only 56 Mining establishments. These two IOF subsectors are rather small in Maryland and, by the nature of their operations, would be expected to be quite different from the remaining IOF sectors in terms of energy-related issues.

The table reports the total number of employees working in each subsector and the total amount of energy consumed by each subsector. Energy consumption is estimated by multiplying the number of employees in each subsector by the corresponding consumption per employee value shown in Table 3.1. Ideally, we would have liked to use the consumption per dollar of value of shipment. However, the DBED database does not contain exact sales

3. Assessment Criteria and Industry Selection...

figures but only sales ranges at each establishment. These are rough estimates since we are applying regional averages, but do allow us to make comparisons between subsectors.

The highlighted subsectors all consume at least 10 trillion Btu of energy. As seen in the table, Food Processing (Food and Beverage & Tobacco), Forest Products (Wood & Paper), Petroleum & Coal, Chemicals, Nonmetallic Minerals, and Primary Metals are all important energy consuming subsectors in Maryland. Textile Mills, while an energy intensive industry in the region, does not have a large enough presence in the state to warrant inclusion in our study.

Table 3.2
Analysis of DBED Database
Estimated Total Energy Consumption by Maryland Industrial Establishments

NAICS Code	Subsector and Industry	Establishments	Employees	Consumption (million Btu)
311	Food	295	19,410	11,201,511
312	Beverage and Tobacco Products	43	3,206	2,474,711
313	Textile Mills	14	1,568	1,213,475
314	Textile Product Mills	173	2,781	1,000,604
315	Apparel	65	2,989	261,538
316	Leather and Allied Products	16	738	49,667
321	Wood Products	239	5,626	7,198,467
322	Paper	74	5,520	44,999,040
323	Printing and Related Support	950	20,600	2,929,320
324	Petroleum and Coal Products	56	3,527	163,823,154
325	Chemicals	221	13,371	108,976,324
326	Plastics and Rubber Products	140	10,515	4,380,549
327	Nonmetallic Mineral Products	176	5,528	12,068,177
3272	Glass and Glass Products	37	892	1,699,438
327310	Cements	3	430	10,136,648
331	Primary Metals	15	688	3,100,472
331111	Iron and Steel Mills	11	720	7,878,240
3312	Steel Products from Purchased Steel	3	5,141	3,369,926
3313	Alumina and Aluminum	15	1,037	6,912,124
3315	Foundries	13	787	713,022
332	Fabricated Metal Products	777	24,439	5,774,936
333	Machinery	251	12,536	1,615,890
334	Computer and Electronic Products	316	36,340	4,418,944
335	Electrical Equip, Appliances, and Components	92	2,804	733,246
336	Transportation Equipment	128	10,896	2,491,915
337	Furniture and Related Products	299	4,818	572,860
339	Miscellaneous	617	14,869	3,367,829
	Non-Industrial Establishments	1,175	68,727	
	Total	6,214	280,503	413,362,027

2.43.4 REVENUE ANALYSIS OF DBED DATABASE

Table 3.3 shows the number of establishments in each subsector with at least \$5M in annual sales. It is expected that energy is a non-trivial issue for businesses of this size. For example, if a manufacturer spends 5% of revenues on energy, these companies spend at

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least \$250,000 per year for energy. Comparing Tables 3.2 and 3.3 demonstrates the merits of this logic. There are 5,039 manufacturers in Maryland as seen in Table 3.2, but only 21% (1,077) have sales over \$5M. When the number of employees is used to estimate energy consumption, these larger manufacturers use 75% of all the energy consumed by MD manufacturers (309,083,297 of the 413,362,027 million Btu).

Table 3.3
Analysis of DBED Database
Maryland Industrial Establishments with \$5M+ Annual Sales

NAICS Code	Subsector and Industry	Establishments	Employees	Consumption (million Btu)	% of Total Consumption
311	Food	147	16,143	9,316,125	83%
312	Beverage and Tobacco Products	24	2,911	2,247,001	91%
313	Textile Mills	5	1,470	1,137,633	94%
314	Textile Product Mills	7	848	305,110	30%
315	Apparel	13	1,837	160,738	61%
316	Leather and Allied Products	1	170	11,441	23%
321	Wood Products	42	3,598	4,603,641	64%
322	Paper	36	4,953	40,376,856	90%
323	Printing and Related Support	91	11,572	1,645,538	56%
324	Petroleum and Coal Products	35	2,084	96,798,257	59%
325	Chemicals	120	11,934	97,264,487	89%
326	Plastics and Rubber Products	55	8,848	3,686,077	84%
327	Nonmetallic Mineral Products	42	3,430	7,488,033	62%
3272	Glass and Glass Products	6	588	1,120,258	66%
327310	Cements	3	430	10,136,648	100%
331	Primary Metals	10	655	2,951,758	95%
331111	Iron and Steel Mills	8	689	7,539,038	96%
3312	Steel Products from Purchased Steel	3	5,141	3,369,926	100%
3313	Alumina and Aluminum	5	942	6,278,901	91%
3315	Foundries	3	405	366,930	51%
332	Fabricated Metal Products	113	12,442	2,940,045	51%
333	Machinery	69	9,791	1,262,060	78%
334	Computer and Electronic Products	125	31,842	3,871,987	88%
335	Electrical Equip, Appliances, and Components	22	1,826	477,499	65%
336	Transportation Equipment	31	9,951	2,275,794	91%
337	Furniture and Related Products	22	2,003	238,157	42%
339	Miscellaneous	39	5,357	1,213,361	36%
	Non-Industrial Establishments	328	53,152		
	Total	1,405	205,012	309,083,297	75%

A note on Sales: 560 records in the DBED database were missing sales data. However, 193 had total sales data for the parent company. For these records, parent sales data was used as a substitute, with the added criteria that at least 20 employees worked at the location.

2.53.5 RECOMMENDATION

We recommended focusing the efforts of the industrial assessment study on manufacturers with at least \$5M in sales in the subsectors highlighted in Table 3.3: Food, Beverage & Tobacco; Wood; Paper; Petroleum & Coal; Chemicals; Nonmetallic Minerals; and Primary Metals. These NAICS subsectors include the following current IOF subsectors: Aluminum,

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Chemicals, Forest Products, Glass, Metal Casting, Petroleum, and Steel. The Maryland Energy Administration also requested that the sample include all Maryland establishments that were identified by a Department of Energy (DOE) study as being among the 5,000 largest energy-consuming facilities in the U.S. Targeting the subsectors highlighted in Table 3.3 and the largest energy consumers identified in the DOE report resulted in a sample of 507 establishments in the assessment study.

3.14.1 SURVEY INSTRUMENTS

The establishments in the assessment sample, as described in the previous chapter, were each mailed a survey packet consisting of a cover letter (printed on MEA letterhead), printed survey, and business reply envelope. Examples of the cover letter and survey can be found in Appendices A.1 and A.2, respectively.

The survey instrument was designed to address 16 topic areas:

- Company name
- Type of product manufactured
- Quantity of product manufactured
- Size of facility in terms of employees and area
- Geographic location
- Main manufacturing process
- Minor manufacturing process
- Major equipment and technology used
- Age of equipment used
- Energy efficiency experience
- Training needs and desires
- Future industry trends
- Energy use by fuel and end-use
- Energy intensity
- Willingness to take the lead as a State IOF Champion
- Other business characteristics

The DBED database elements and survey questions were mapped against these topic areas. This mapping is shown in Appendix A.3.

A total of 507 industrial establishments were targeted for the assessment survey. However, 234 of the records in the DBED database were missing contact information necessary for the survey mail-out. These establishments received a telephone screening call to identify the proper individual to receive the survey. The script used for this telephone screening is shown in Appendix A.4.

After the survey had been in the field for about 3 weeks, 173 establishments from the Petroleum, Chemicals, and Primary Metals subsectors received a follow-up call in an effort to boost the response rates for these targeted subsectors. The script used for this telephone follow-up is shown in Appendix A.5.

The final step in the assessment study was to conduct on-site visits with a select number of establishments. The purpose of these on-site visits was to explore in more depth the topics covered by the assessment survey. The script used to recruit establishments to participate in the on-site visits is shown in Appendix A.6.

3-24.2 RESPONSE RATE

A total of 80 surveys were returned for an overall response rate of 15.8% (see Table 4.1). Only three completed surveys were obtained for the Petroleum subsector. In order to protect the confidentiality of individual establishments, subsectoral survey results cannot be reported for this subsector.

Table 4.1
Overall Response Rate

			Survey Completion Flag		Total
			Not Complete	Survey Complete	
Subsectors	Food Processing	Count	143	30	173
		Row %	82.7%	17.3%	100.0%
	Forest Products	Count	63	15	78
		Row %	80.8%	19.2%	100.0%
	Petroleum	Count	31	3	34
		Row %	91.2%	8.8%	100.0%
	Chemicals	Count	100	15	115
		Row %	87.0%	13.0%	100.0%
	Nonmetallic Mineral Products	Count	42	11	53
		Row %	79.2%	20.8%	100.0%
	Primary Metals	Count	24	5	29
		Row %	82.8%	17.2%	100.0%
	Other	Count	24	1	25
		Row %	96.0%	4.0%	100.0%
Total		Count	427	80	507
		Row %	84.2%	15.8%	100.0%

273 records in the DBED database had complete contact information and were mailed a survey immediately at the start of the study. However, contact information was missing for 234 records. A telephone screening call was needed before surveys could be mailed to these establishments. With the exception of “hard refusals”, all establishments (even those not contacted because of a bad telephone number in the database) were mailed a survey. As shown in Table 4.2, making an initial phone call to gather contact information and to establish buy-in improved the response rate. Even the simple act of talking with the organization’s receptionist boosted the response rate.

Table 4.2
Telephone Screen Results

			Survey Completion Flag		Total
			Not Complete	Survey Complete	
Phone Screen Disposition	Not Screened	Count	237	36	273
		Row %	86.8%	13.2%	100.0%
	Receptionist Contact	Count	101	26	127
		Row %	79.5%	20.5%	100.0%
	Voice Mail Message	Count	26	11	37
		Row %	70.3%	29.7%	100.0%
	Respondent Contact	Count	9	2	11
		Row %	81.8%	18.2%	100.0%
	Refusal	Count	30	0	30
		Row %	100.0%	.0%	100.0%
	Bad Number	Count	24	5	29
		Row %	82.8%	17.2%	100.0%
Total		Count	427	80	507
		Row %	84.2%	15.8%	100.0%

After the survey had been in the field for about three weeks, it was apparent that the completion rates were falling short in several of the smaller subsectors (Petroleum, Chemicals, and Primary Metals). Follow-up telephone calls were made to encourage establishments in these subsectors to complete the survey. Table 4.3 shows that targeting these selected subsectors with a follow-up telephone call had a small effect on the overall number of survey completes. Very few establishments responded even after requesting an additional survey be sent to them.

Table 4.3
Follow-Up Telephone Call Results

			Survey Completion Flag		Total
			Not Complete	Survey Complete	
Phone Follow-Up	No Follow-Up	Count	272	62	334
		Row %	81.4%	18.6%	100.0%
	Receptionist Contact	Count	15	1	16
		Row %	93.8%	6.3%	100.0%
	Voice Mail Message	Count	66	9	75
		Row %	88.0%	12.0%	100.0%
	Mailed Another Copy as requested	Count	15	2	17
		Row %	88.2%	11.8%	100.0%
	Said Would Finish and Mail Survey	Count	1	2	3
		Row %	33.3%	66.7%	100.0%
	Survey Complete and in Mail	Count	1	3	4
		Row %	25.0%	75.0%	100.0%
	Phone Complete	Count	0	1	1
		Row %	.0%	100.0%	100.0%
	Refusal/Bad Number	Count	57	0	57
		Row %	100.0%	.0%	100.0%
Total		Count	427	80	507
		Row %	84.2%	15.8%	100.0%

3.34.3 RESPONSE BIAS

When conducting survey research, one is always concerned that the results are skewed by response bias. Response bias occurs when there are underlying differences between respondents and non-respondents. Often, it is impossible to test for these differences because little is known about the population. In this study, however, we have information concerning sales, number of employees, and square footage on all plants in the sample. This information was provided in the DBED database. Together, these three variables give an indication of the size of each establishment in the sample.

The next three tables compare respondents and non-respondents on sales, number of employees, and square footage. In Table 4.4 one can see a tendency for establishments with sales of \$5-9.9MM to be more responsive to the survey, while establishments with higher levels of sales were generally less responsive. Likewise, establishments with fewer than 50 employees were more responsive (Table 4.5). Finally, Table 4.6 shows that establishments with less than 50,000 square feet were more responsive to the survey. In general, these tables show a tendency for smaller firms to be more responsive to the assessment survey.

Table 4.4
Annual Sales by Survey Completion

			Survey Completion Flag		Total
			Not Complete	Survey Complete	
Sales Range (Categorical)	Unknown	Count	36	7	43
		Col. %	8.4%	8.8%	8.5%
	\$500-\$999K	Count	2	0	2
		Col. %	.5%	.0%	.4%
	\$1MM-\$4.9MM	Count	5	1	6
		Col. %	1.2%	1.3%	1.2%
	\$5MM-\$9.9MM	Count	138	30	168
		Col. %	32.3%	37.5%	33.1%
	\$10MM-\$24.9MM	Count	130	21	151
		Col. %	30.4%	26.3%	29.8%
	\$25MM-\$49.9MM	Count	65	11	76
		Col. %	15.2%	13.8%	15.0%
	\$50MM-\$99.9MM	Count	32	2	34
		Col. %	7.5%	2.5%	6.7%
	\$100MM-\$499.9MM	Count	16	6	22
		Col. %	3.7%	7.5%	4.3%
	\$500MM-\$999.9MM	Count	1	2	3
		Col. %	.2%	2.5%	.6%
	\$1B-\$9.9B	Count	2	0	2
		Col. %	.5%	.0%	.4%
Total		Count	427	80	507
		Col. %	84.2%	15.8%	100.0%

Table 4.5
Number of Employees by Survey Completion

			Survey Completion Flag		Total
			Not Complete	Survey Complete	
Number of Employees (Categorical)	Under 20	Count	51	10	61
		Col. %	11.9%	12.5%	12.0%
	20-49	Count	132	30	162
		Col. %	30.9%	37.5%	32.0%
	50-99	Count	108	18	126
		Col. %	25.3%	22.5%	24.9%
	100-249	Count	91	12	103
		Col. %	21.3%	15.0%	20.3%
	250-499	Count	31	6	37
		Col. %	7.3%	7.5%	7.3%
	500-999	Count	10	3	13
		Col. %	2.3%	3.8%	2.6%
	1,000-4,999	Count	3	1	4
		Col. %	.7%	1.3%	.8%
	5,000+	Count	1	0	1
		Col. %	.2%	.0%	.2%
Total		Count	427	80	507
		Col. %	84.2%	15.8%	100.0%

Table 4.6
Square Footage by Survey Completion

			Survey Completion Flag		Total
			Not Complete	Survey Complete	
Square Footage (Categorical)	Unknown	Count	228	37	265
		Col. %	53.4%	46.3%	52.3%
	Under 1,000	Count	1	0	1
		Col. %	.2%	.0%	.2%
	1,000-4,999	Count	21	5	26
		Col. %	4.9%	6.3%	5.1%
	5,000-9,999	Count	20	5	25
		Col. %	4.7%	6.3%	4.9%
	10,000-24,999	Count	46	15	61
		Col. %	10.8%	18.8%	12.0%
	25,000-49,999	Count	36	8	44
		Col. %	8.4%	10.0%	8.7%
	50,000-99,999	Count	73	9	82
		Col. %	17.1%	11.3%	16.2%
	100,000+	Count	2	1	3
		Col. %	.5%	1.3%	.6%
Total		Count	427	80	507
		Col. %	84.2%	15.8%	100.0%

4.5. ASSESSMENT RESULTS

This chapter is basically organized around the 16 topic areas listed in Chapter 4 that are addressed by the assessment survey, although company name and geographic location are not reported in this chapter.

Individual establishment-level results are excluded from this report to protect the confidentiality of survey participants. Results for subsectors with less than 5 responding establishments are also not reported for confidentiality reasons, though responses are included in summary totals. The results come primarily from the surveys, however they are sometimes complemented by a variety of other sources, including the DBED database, survey, on-site visits, and secondary resources, such as EIA's MECS and US Census Bureau data.

4.15.1 TYPE OF PRODUCT MANUFACTURED & MANUFACTURING PROCESSES

There is a significant level of diversity in the types of products manufactured even within each target subsector. This diversity in turn is reflected in the types of operations and operation-specific technology found in each establishment. For example, in the Food Processing subsector, products include basic grain products, animal feeds, poultry, slaughtered and processed meats, nutritional supplements, bakery goods, bottled beverages (alcoholic and non-alcoholic), etc. Forest Products includes paper milling operations, specialty papers (e.g., pressure-sensitive labels, envelopes, spiral notebooks, paper plates), corrugated products, logging, basic lumber production, architectural products (e.g., windows, doors, trusses, framing), wood flooring, wood furniture, etc. Petroleum, a rather small subsector, is equally diverse. Though there are no refining operations in the State of Maryland, this subsector includes asphalt-related products, blending and packaging of oils and lubricants, and some basic plastics manufacturing. Chemical plants each have their own processes necessary to create their specific products. Nonmetallic Mineral Products includes glass and bottles, aggregates (e.g., sand, crushed rock, gravel), bricks, clay products, cement and concrete, pre-cast concrete products, wallboard, tile, etc. Primary Metals, another small subsector, has equally diverse operations ranging from aluminum and steel refining to the production of final products made from metals.

4.25.2 QUANTITY OF PRODUCT MANUFACTURED

Table 5.1 shows the quantity of product manufactured, as measured by total sales, by all establishments in the assessment sample. This information was provided in the DBED database. However, survey results were used when available to overwrite DBED data. DBED data was used for non-responding establishments. The table shows that the majority (73%) of industries included in the assessment sample have sales between \$5 million and \$50 million.

Table 5.1
Annual Revenue or Sales

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Sales Range (Categorical)	Unknown	Count	10	4	3	9	5	3	3	37
		Col. %	5.8%	5.1%	8.8%	7.8%	9.4%	10.3%	12.0%	7.3%
	Under \$500K	Count	1	0	0	1	0	0	1	3
		Col. %	.6%	.0%	.0%	.9%	.0%	.0%	4.0%	.6%
	\$500-\$999K	Count	3	0	0	1	0	0	2	6
		Col. %	1.7%	.0%	.0%	.9%	.0%	.0%	8.0%	1.2%
	\$1MM-\$4.9MM	Count	5	5	5	7	3	0	1	26
		Col. %	2.9%	6.4%	14.7%	6.1%	5.7%	.0%	4.0%	5.1%
	\$5MM-\$9.9MM	Count	48	29	11	28	24	6	4	150
		Col. %	27.7%	37.2%	32.4%	24.3%	45.3%	20.7%	16.0%	29.6%
	\$10MM-\$24.9MM	Count	53	27	7	30	11	15	5	148
		Col. %	30.6%	34.6%	20.6%	26.1%	20.8%	51.7%	20.0%	29.2%
	\$25MM-\$49.9MM	Count	22	11	4	20	4	3	7	71
		Col. %	12.7%	14.1%	11.8%	17.4%	7.5%	10.3%	28.0%	14.0%
	\$50MM-\$99.9MM	Count	18	1	3	11	4	0	1	38
		Col. %	10.4%	1.3%	8.8%	9.6%	7.5%	.0%	4.0%	7.5%
	\$100MM-\$499.9MM	Count	13	1	1	6	2	1	0	24
		Col. %	7.5%	1.3%	2.9%	5.2%	3.8%	3.4%	.0%	4.7%
	\$500MM-\$999.9MM	Count	0	0	0	1	0	0	0	1
		Col. %	.0%	.0%	.0%	.9%	.0%	.0%	.0%	.2%
	\$1B-\$9.9B	Count	0	0	0	1	0	1	1	3
		Col. %	.0%	.0%	.0%	.9%	.0%	3.4%	4.0%	.6%
Total		Count	173	78	34	115	53	29	25	507
		Col. %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

4.35.3 SIZE OF FACILITY IN TERMS OF EMPLOYEES AND AREA

Tables 5.2 and 5.3 report the number of employees and square footage for all establishments in the assessment sample. This information was provided in the DBED database. However, survey results were used when available to overwrite DBED data. DBED data was used for non-responding establishments. As seen in Table 5.2, nearly 70% of the sampled establishments have less than 100 employees.

Table 5.2
Number of Employees

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Number of Employees (Categorical)	Under 20	Count	25	0	15	24	0	1	2	67
		Col. %	14.5%	.0%	44.1%	20.9%	.0%	3.4%	8.0%	13.2%
	20-49	Count	57	22	10	40	15	12	3	159
		Col. %	32.9%	28.2%	29.4%	34.8%	28.3%	41.4%	12.0%	31.4%
	50-99	Count	34	29	3	25	22	8	3	124
		Col. %	19.7%	37.2%	8.8%	21.7%	41.5%	27.6%	12.0%	24.5%
	100-249	Count	33	24	4	14	14	5	8	102
		Col. %	19.1%	30.8%	11.8%	12.2%	26.4%	17.2%	32.0%	20.1%
	250-499	Count	17	2	2	8	2	1	6	38
		Col. %	9.8%	2.6%	5.9%	7.0%	3.8%	3.4%	24.0%	7.5%
	500-999	Count	7	0	0	3	0	1	1	12
		Col. %	4.0%	.0%	.0%	2.6%	.0%	3.4%	4.0%	2.4%
	1,000-4,999	Count	0	1	0	1	0	0	2	4
		Col. %	.0%	1.3%	.0%	.9%	.0%	.0%	8.0%	.8%
	5,000+	Count	0	0	0	0	0	1	0	1
		Col. %	.0%	.0%	.0%	.0%	.0%	3.4%	.0%	.2%
Total		Count	173	78	34	115	53	29	25	507
		Col. %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 5.3
Total Square Footage

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Square Footage (Categorical)	Unknown	Count	78	24	23	56	21	11	16	229
		Col. %	45.1%	30.8%	67.6%	48.7%	39.6%	37.9%	64.0%	45.2%
	Under 1,000	Count	1	0	0	1	0	0	0	2
		Col. %	.6%	.0%	.0%	.9%	.0%	.0%	.0%	.4%
	1,000-4,999	Count	6	3	2	6	10	0	0	27
		Col. %	3.5%	3.8%	5.9%	5.2%	18.9%	.0%	.0%	5.3%
	5,000-9,999	Count	15	4	2	5	1	2	0	29
		Col. %	8.7%	5.1%	5.9%	4.3%	1.9%	6.9%	.0%	5.7%
	10,000-24,999	Count	25	10	1	16	6	4	1	63
		Col. %	14.5%	12.8%	2.9%	13.9%	11.3%	13.8%	4.0%	12.4%
	25,000-49,999	Count	17	13	3	14	4	2	0	53
		Col. %	9.8%	16.7%	8.8%	12.2%	7.5%	6.9%	.0%	10.5%
	50,000-99,999	Count	23	22	3	15	5	6	7	81
		Col. %	13.3%	28.2%	8.8%	13.0%	9.4%	20.7%	28.0%	16.0%
	100,000+	Count	8	2	0	2	6	4	1	23
		Col. %	4.6%	2.6%	.0%	1.7%	11.3%	13.8%	4.0%	4.5%
Total		Count	173	78	34	115	53	29	25	507
		Col. %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

4.45.4 MAJOR EQUIPMENT AND TECHNOLOGY USED

The average number of various types of equipment is shown in Table 5.4. Small motors are quite prevalent in all subsectors, especially in the Chemicals and Nonmetallic Mineral Products subsectors. On the other hand, many of these motors are not variable speed drive. It is important to note that the results for Forest Products are skewed by one large paper mill that responded to the survey. When this establishment is excluded from the analysis, the average number of each type of equipment is significantly lower for the Forest Products subsector.

Table 5.4
Average Number of Equipment Installed

	Subsectors							
	Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	Total
Motors <= 75 hp	87	342		141	151	55		148
VSD Motors <= 75 hp	33	10		10	26	6		20
Motors > 75 hp	4	58		2	20	3		16
VSD Motors > 75 hp	1	13		1	9	0		4
Air Compressors	3	3		2	3	2		3
Refrigeration	2	9		4	1	1		3
Boilers	1	1		2	0	1		1
Steam Distribution	1	0		0	0	0		0
Steam Traps	15	14		81	0	32		26
Ventilation	4	14		13	2	10		7
Cooking	1	0		0	0	0		0
Number of	30	15		15	11	5		80

Note: Results for Forest Products are skewed by the presence of one large paper mill. While the results after excluding this outlier cannot be shown because of confidentiality issues, average number of equipment installed for the Forest Products subsector is significantly lower without this paper mill.

The survey also asked respondents to describe the types of refrigeration, cooking and other process-related equipment installed at the facility. The list of equipment is quite diverse as would be expected given the variety in these subsectors. Because of this diversity of equipment, quantitative analysis is not possible but the lists of responses (edited to eliminate redundancies) are provided below.

Types of refrigeration equipment described:

- Air dryer
- Ammonia chillers
- Ammonia compressors
- CO2 tank
- Freon chillers
- Packaged air units
- Refrigerated warehouse
- Walk-in cooler
- Walk-in freezer
- Water chiller

Types of commercial cooking equipment described:

- Cafeteria equipment
- Ovens
- Restaurant-style kitchen
- Roasters
- Smoke house
- Steam jacketed kettles/ tank glass pressure vessels

Other process-specific equipment described:

- | | |
|--|---|
| • Annealing oven | • Bagger and former |
| • Battery chargers for forklifts | • Boiler smith wood waste boiler used for the production of steam for dry kilns |
| • Centrifugal separators | • Chemical mixing tanks |
| • Circulation fans | • Coffee roasters |
| • Confectioner's sugar mill | • Crimper to process grain |
| • Crusher | • Door machines |
| • Dough production machines | • Dry ice machine |
| • Drying kiln | • Electric oven for drying |
| • Electrolytic cells | • Electron microscopes |
| • Fan/air handling units | • Fillers |
| • Fluid bed dryer | • Gas fired roasters |
| • Gas kiln/kettles | • Glass melting furnace |
| • Glass washer | • Glassware sterilization oven |
| • Grain dryers | • Grinding mills |
| • Hammer mills | • Heat room |
| • Heat treating furnaces | • Heat tunnel |
| • Homogenizer | • Hot melt glass sealer |
| • Ice machines | • Meat grinding & mixing equipment |
| • Melting furnaces | • Non-ferrous bailer |
| • Paint room | • Pellet mills |
| • Plate heat exchange for pasteurization | • Plate rectifier |

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- Printing presses
- Pulp digesters/starch cookers
- Sawmill equipment
- Slurry pumps
- Steel bailer
- Vacuum pan crystallizer
- Water supply pump
- Propane powered forklifts
- Roller mill
- Shrink tunnel
- Steam turbine electric generator
- Tunnel kiln
- Water softener

As seen in Table 5.5, less than 20% of the surveyed establishments have any type of computerized energy management system. The Chemicals and Nonmetallic Mineral Products subsectors have the highest installation rates, while Forest Products has the lowest. When computerized energy management systems are used, they generally are installed to control manufacturing processes.

Table 5.5
Computerized Energy Management System Installation Rate

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Type of computerized energy management system	No Computerized EMS	Count	24	14		11	8	4		65
		Col. %	80.0%	93.3%		73.3%	72.7%	80.0%		81.3%
	HVAC temperature control	Count	0	0		2	0	0		2
		Col. %	.0%	.0%		13.3%	.0%	.0%		2.5%
	Manufacturing process control	Count	3	0		2	2	1		8
		Col. %	10.0%	.0%		13.3%	18.2%	20.0%		10.0%
	Control of overall electric demand charges	Count	1	1		0	0	0		2
		Col. %	3.3%	6.7%		.0%	.0%	.0%		2.5%
	Other (HVAC and process controls)	Count	2	0		0	1	0		3
		Col. %	6.7%	.0%		.0%	9.1%	.0%		3.8%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.6 shows the installation rates of general energy saving technologies for the entire United States. These data come from the Energy Information Administration's 1998 Manufacturing Energy Consumption Survey (MECS). Compared to this table, the survey results indicate that Maryland industries use computerized energy management systems less than the US average, particularly for controlling manufacturing process equipment. These differences may be explained in part by the fact that Maryland industries tend to be smaller than US industries in general. Table 5.7 compares US and Maryland industries in terms of average value of sales and number of employees per facility. With the exception of a few

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subsectors (Food, Cements, Primary Metals, Iron and Steel Mills, and Aluminum), Maryland industries produce less in terms of average value of sales than US industries in general.

Table 5.6
US Installation Rates for General Energy Saving Technologies

NAICS Code	Subsector and Industry	Computer Control of Building-Wide Environments	Computer Control of Processes or Major Energy-Using Equipment	Adjustable Speed Motors
311	Food	8.1%	21.7%	37.5%
312	Beverage and Tobacco Products	16.8%	NC	47.0%
321	Wood Products	2.4%	13.9%	25.3%
322	Paper	7.1%	23.1%	41.2%
324	Petroleum and Coal Products	7.0%	29.0%	42.5%
324110	Petroleum Refineries	19.2%	52.7%	54.0%
325	Chemicals	9.1%	30.7%	41.0%
327	Nonmetallic Mineral Products	5.7%	22.6%	20.4%
3272	Glass and Glass Products	NC	NC	NC
327310	Cements	NC	NC	NC
331	Primary Metals	7.6%	29.7%	40.1%
331111	Iron and Steel Mills	16.9%	61.8%	NC
3312	Steel Products from Purchased Steel	5.6%	20.6%	44.9%
3313	Alumina and Aluminum	NC	NC	NC
3315	Foundries	7.9%	37.8%	31.6%
	Total (All Industries)	7.5%	12.6%	21.5%

Source: 1998 Manufacturing Energy Consumption Survey, Energy Information Administration, US Department of Energy
NC = Not computed due to insufficient sample size.

Table 5.7

Size Comparisons between US and Maryland Industries

		Averages per Facility			
		US Industries		Maryland Industries	
		Value of Sales	Number of Employees	Value of Sales	Number of Employees
NAICS Code	Subsector and Industry				
311	Food	16,084	56	16,373	48
312	Beverage and Tobacco Products	35,590	64	25,457	59
321	Wood Products	5,124	33	3,777	26
322	Paper	25,549	98	21,208	137
324	Petroleum and Coal Products	81,771	50	9,245	27
324110	Petroleum Refineries	371,523	154	NA	NA
325	Chemicals	31,053	65	29,003	81
327	Nonmetallic Mineral Products	5,310	31	4,893	30
3272	Glass and Glass Products	10,041	57	3,271	44
327310	Cements	23,442	61	33,845	111
331	Primary Metals	33,403	120	75,005	223
331111	Iron and Steel Mills	207,111	533	491,085	1,377
3312	Steel Products from Purchased Steel	27,132	94	13,141	73
3313	Alumina and Aluminum	80,797	211	143,934	400
3315	Foundries	10,330	81	1,677	12
	Total (All Industries)	10,562	46	9,136	41

Source: 1997 Economic Census of Manufacturing, US Census Bureau

4.55.5 AGE OF EQUIPMENT USED

Table 5.8 presents the average age of equipment at each facility. According to the survey results, the Primary Metals subsector tends to have the oldest equipment.

Table 5.8
Average Age of Equipment Installed*

	Subsectors							Total
	Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Main heating system	13.0 (27)	13.8 (13)		10.8 (14)	15.5 (11)	20.3 (4)		13.7 (71)
Main cooling system	8.3 (27)	8.6 (13)		9.2 (14)	11.7 (10)	15.3 (4)		9.5 (70)
Main water heating system	10.0 (27)	9.4 (13)		8.1 (14)	11.2 (11)	15.5 (4)		10.0 (71)
Motors <= 75 hp	9.5 (13)	12.3 (11)		6.9 (7)	8.7 (7)	9.0 (3)		9.8 (43)
VSD Motors <= 75 hp	8.3 (3)	14.0 (5)		3.3 (4)	9.0 (3)	7.5 (2)		8.8 (17)
Motors > 75 hp- Age	7.1 (11)	12.2 (5)		6.5 (2)	10.2 (5)	14.0 (3)		9.4 (26)
VSD Motors > 75 hp	7.0 (1)	15.0 (1)		3.5 (2)	8.7 (3)			7.9 (7)
Air Compressors	9.3 (21)	11.1 (11)		7.8 (11)	6.2 (9)	15.7 (3)		9.2 (57)
Refrigeration	10.5 (12)	12.0 (2)		8.0 (4)	3.0 (1)	16.0 (2)		10.3 (21)
Boilers	13.0 (13)	23.5 (2)		11.1 (7)		25.0 (2)		14.8 (26)
Steam Distribution	18.0 (8)	50.0 (1)		18.5 (2)		30.0 (2)		22.9 (14)
Steam Traps	8.7 (6)	7.0 (1)		11.0 (2)		27.5 (2)		12.4 (11)
Ventilation	5.5 (8)	14.0 (3)		8.8 (9)	6.0 (3)	22.5 (2)		9.2 (27)
Cooking	12.0 (4)			10.0 (1)				11.6 (5)

* Note: Number of respondents who reported equipment age is enclosed in parentheses.

4.65.6 ENERGY EFFICIENCY EXPERIENCE

Table 5.9 shows that most companies have someone, either an individual, group, or department, responsible for managing energy use and cost. However, while 60% of companies in general have someone responsible for energy management, only 40% of the Chemical companies have anyone with energy management responsibilities. In the Food Processing and Forest Products subsectors, an individual is most often responsible for energy management.

Table 5.9
Energy Management Responsibilities

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Someone is assigned to manage energy use and cost	Yes, one person	Count	14	6		4	3	1		29
		Col. %	46.7%	40.0%		26.7%	27.3%	20.0%		36.3%
	Yes, a group	Count	3	2		0	2	2		9
		Col. %	10.0%	13.3%		.0%	18.2%	40.0%		11.2%
	Yes, a department	Count	3	0		2	3	1		10
		Col. %	10.0%	.0%		13.3%	27.3%	20.0%		12.5%
	No	Count	10	7		9	3	1		32
		Col. %	33.3%	46.7%		60.0%	27.3%	20.0%		40.0%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

While 60% of the establishments surveyed have assigned energy management responsibilities to someone, only 40% have assigned an annual budget to support these responsibilities (Table 5.10). The Nonmetallic Mineral Products subsector has the highest percentage of companies with an energy management budget.

Table 5.10
Energy Management Budget

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Annual budget is assigned to energy management activities	Yes	Count	9	1		3	7	1		22
		Col. %	30.0%	6.7%		20.0%	63.6%	20.0%		27.5%
	No	Count	21	14		12	4	4		58
		Col. %	70.0%	93.3%		80.0%	36.4%	80.0%		72.5%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Half of the companies surveyed have energy cost reduction goals, as seen in Table 5.11. This overall number masks the fact that the Forest Products and Chemicals subsectors have fewer companies with energy cost reduction goals.

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Table 5.11
Energy Cost Reduction Goals

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Company has energy cost reduction goals	Yes	Count	20	4		4	7	3		40
		Col. %	66.7%	26.7%		26.7%	63.6%	60.0%		50.0%
	No	Count	10	11		11	4	2		40
		Col. %	33.3%	73.3%		73.3%	36.4%	40.0%		50.0%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

The survey included a series of yes/no questions to identify individual energy management responsibilities at each facility. Table 5.12 reports the percentage of companies in each subsector that have someone responsible for each energy management task. Because respondents could answer yes to multiple questions, counts and percentages for each row do not add to the total shown in the final two rows. Facilities in the Nonmetallic Mineral Products, Primary Metals, and, to a lesser extent, Food Processing subsectors are more likely to have someone assigned to each of the tasks. Across all subsectors, companies are least focused on managing peak electrical demand for the facility or key buildings/operations.

Table 5.12
Individual Energy Management Responsibilities

		Subsectors							Total
		Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Someone tracks energy use or costs for entire facility	Count	21	8		8	7	5		51
	Col. %	70.0%	53.3%		53.3%	63.6%	100.0%		63.8%
Someone monitors energy use for key buildings	Count	12	6		6	8	3		36
	Col. %	40.0%	40.0%		40.0%	72.7%	60.0%		45.0%
Someone identifies energy-reducing facility improvements	Count	21	5		6	9	3		45
	Col. %	70.0%	33.3%		40.0%	81.8%	60.0%		56.2%
Someone qualifies potential energy efficiency improvements by cost and ROI	Count	20	6		6	9	4		47
	Col. %	66.7%	40.0%		40.0%	81.8%	80.0%		58.7%
Someone controls/reduces peak electrical demand for facility	Count	18	5		2	3	4		33
	Col. %	60.0%	33.3%		13.3%	27.3%	80.0%		41.3%
Someone controls/reduces peak electrical demand for specific buildings/equipment	Count	13	3		2	3	3		26
	Col. %	43.3%	20.0%		13.3%	27.3%	60.0%		32.5%
Total		Count	30	15		15	11	5	80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%	100.0%

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When companies indicated that no one was responsible for any of the energy management activities in Table 5.12, the survey explored the reasons for this. Table 5.13 shows that these companies are generally focused on other priorities because energy costs are not seen as a large expense. On the other hand, there are some companies that lack the internal resources (skilled staff or money) to perform these activities.

Table 5.13
Main Reason No One is Assigned to Energy Management Activities

			Subsectors					Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	
Main reason no one is assigned to energy management activities	Energy costs aren't that large of an expense	Count	1	3		2	1	8
		Col. %	16.7%	37.5%		25.0%	33.3%	30.8%
	We have more important priorities for our staff resources	Count	3	3		2	0	8
		Col. %	50.0%	37.5%		25.0%	.0%	30.8%
	Staff do not have the skills/knowledge to do this	Count	1	1		1	0	3
		Col. %	16.7%	12.5%		12.5%	.0%	11.5%
	No cash available for this	Count	1	0		1	1	3
		Col. %	16.7%	.0%		12.5%	33.3%	11.5%
	Other (Combination of above reasons)	Count	0	1		2	1	4
		Col. %	.0%	12.5%		25.0%	33.3%	15.4%
Total		Count	6	8		8	3	26
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%

As Table 5.14 shows, it has been almost 2 years on average since firms have had an energy audit. But, nearly 60% report that they have never had an energy audit at their facility. The Chemicals subsector stands out as having the highest percentage of firms without an energy audit.

Table 5.14
Energy Audits

		Subsectors						
		Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other
Number of years since last energy audit		2.6	1.1		.7	1.5	3.2	1.7
Firms that have never performed an energy audit	Count	16	10		11	5	2	47
	Col. %	53.5%	66.7%		73.3%	45.5%	40.0%	58.8%

Table 5.15 shows that 60% of the companies surveyed have had a major renovation at their facility (project costs over \$10K). On average, these companies have performed almost 4

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major renovations each in the last 2 years. However, saving energy was the major goal behind the renovations for only 21% of all companies surveyed. Forest Products and Primary Minerals stand out as only 13% and 0%, respectively, of companies in these subsectors have undertaken major renovations to reduce energy costs.

Table 5.15
Major Renovations

			Subsectors							
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	Total
Number of major renovations over \$10K in last 2 years			2.8	4.3		8.7	2.5	1.2		3.9
Projects were undertaken to reduce energy costs	Yes	Count	8	2		3	3	0		17
		Col. %	26.7%	13.3%		20.0%	27.3%	0.0%		21.3%
	No	Count	11	8		5	4	3		31
		Col. %	36.7%	53.3%		33.3%	36.4%	60.0%		38.8%
Firms without renovations in last 2 years		Count	11	5		7	4	2		32
		Col. %	36.7%	33.3%		46.7%	36.4%	40.0%		40.0%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

The survey asked a series of questions to assess the decision-making process regarding equipment purchases. Respondents were asked to identify the key staff positions involved in recommending and/or approving equipment purchases. Respondents were also asked to identify any limitations imposed on this authority, specifically if the person could only make recommendations or approvals regarding certain types of equipment or up to a specific dollar amount. Unfortunately, there were very few responses on the survey regarding equipment or dollar limitations so this data is not reported. However, Table 5.16 shows the percentage of various staff positions that are involved in the decision-making process. As the table shows, building managers/engineers and line/production managers are very involved in recommending equipment, but the ultimate approval often must come from upper management (i.e., President/CEO, CFO/Comptroller).

Table 5.16

Personnel Involved in Recommending and Approving Equipment Purchases

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
President or CEO	Recommends	Count	12	11		6	1	3		34
		Col. %	40.0%	73.3%		40.0%	9.1%	60.0%		42.5%
	Approves	Count	22	13		12	8	4		61
		Col. %	73.3%	86.7%		80.0%	72.7%	80.0%		76.3%
CFO or Comptroller	Recommends	Count	3	2		2	0	2		9
		Col. %	10.0%	13.3%		13.3%	.0%	40.0%		11.3%
	Approves	Count	14	5		6	4	4		34
		Col. %	46.7%	33.3%		40.0%	36.4%	80.0%		42.5%
Purchasing Department	Recommends	Count	2	3		4	5	1		15
		Col. %	6.7%	20.0%		26.7%	45.5%	20.0%		18.8%
	Approves	Count	1	1		2	1	0		5
		Col. %	3.3%	6.7%		13.3%	9.1%	.0%		6.3%
Building Manager or Engineer	Recommends	Count	18	6		8	5	4		43
		Col. %	60.0%	40.0%		53.3%	45.5%	80.0%		53.8%
	Approves	Count	10	2		4	2	3		21
		Col. %	33.3%	13.3%		26.7%	18.2%	60.0%		26.3%
Energy Manager	Recommends	Count	5	2		1	2	0		10
		Col. %	16.7%	13.3%		6.7%	18.2%	.0%		12.5%
	Approves	Count	4	0		0	0	1		5
		Col. %	13.3%	.0%		.0%	.0%	20.0%		6.3%
Line or Production Manager	Recommends	Count	15	11		8	6	4		44
		Col. %	50.0%	73.3%		53.3%	54.5%	80.0%		55.0%
	Approves	Count	3	6		4	3	0		16
		Col. %	10.0%	40.0%		26.7%	27.3%	.0%		20.0%
Landlord	Recommends	Count	0	0		0	0	0		1
		Col. %	.0%	.0%		.0%	.0%	.0%		1.3%
	Approves	Count	0	0		1	1	0		3
		Col. %	.0%	.0%		6.7%	9.1%	.0%		3.8%
Contractor	Recommends	Count	1	3		0	1	2		7
		Col. %	3.3%	20.0%		.0%	9.1%	40.0%		8.8%
	Approves	Count	0	0		0	0	1		1
		Col. %	.0%	.0%		.0%	.0%	20.0%		1.3%
Other	Recommends	Count	4	4		6	1	1		17
		Col. %	13.3%	26.7%		40.0%	9.1%	20.0%		21.3%
	Approves	Count	7	3		5	1	1		18
		Col. %	23.3%	20.0%		33.3%	9.1%	20.0%		22.5%
Total		Count	30	15		15	11	5		80
		Col. %	1000%	100.0%		100.0%	100.0%	100.0%		100.0%

Other described:

- Corporate engineering department
- Division managers
- Facilities engineer
- General manager
- Maintenance manager
- Owner
- Plant manager
- Quality manager
- Technical director
- Vice president
- VP operations

As Table 5.16 showed, there are a variety of different staff positions involved in the decision-making process, but it does not show how many of these positions might be involved at a given company. Table 5.17 presents a count of the number of people who might recommend a specific piece of equipment. Companies in the Food Processing and Nonmetallic Mineral Products subsectors are somewhat more likely to have a single person making recommendations. In general, however, most companies have two or three people recommending equipment for purchase. Similarly, Table 5.18 shows that approval authority is more likely to be held by one individual in Food Processing, Forest Products and Nonmetallic Mineral Products, but two or three people may have approval authority in general.

Table 5.17
Number of Personnel Involved in Recommending Equipment Purchases

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Number of people involved in recommending equipment purchase	Missing	Count	3	0		2	1	0		7
		Col. %	10.0%	.0%		13.3%	9.1%	.0%		8.8%
	1	Count	10	2		3	4	1		22
		Col. %	33.3%	13.3%		20.0%	36.4%	20.0%		27.5%
	2	Count	7	3		2	2	0		14
		Col. %	23.3%	20.0%		13.3%	18.2%	.0%		17.5%
	3	Count	8	8		6	3	2		28
		Col. %	26.7%	53.3%		40.0%	27.3%	40.0%		35.0%
	4	Count	0	1		1	1	1		4
		Col. %	.0%	6.7%		6.7%	9.1%	20.0%		5.0%
	5	Count	1	0		0	0	0		1
		Col. %	3.3%	.0%		.0%	.0%	.0%		1.3%
	6	Count	0	1		1	0	1		3
		Col. %	.0%	6.7%		6.7%	.0%	20.0%		3.8%
	7	Count	1	0		0	0	0		1
		Col. %	3.3%	.0%		.0%	.0%	.0%		1.3%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.18

Number of Personnel Involved in Approving Equipment Purchases

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Number of people involved in approving equipment purchase	Missing	Count	2	0		2	1	0		6
		Col. %	6.7%	.0%		13.3%	9.1%	.0%		7.5%
	1	Count	14	5		2	4	1		27
		Col. %	46.7%	33.3%		13.3%	36.4%	20.0%		33.8%
	2	Count	5	6		6	3	1		23
		Col. %	16.7%	40.0%		40.0%	27.3%	20.0%		28.8%
	3	Count	3	3		2	2	2		12
		Col. %	10.0%	20.0%		13.3%	18.2%	40.0%		15.0%
	4	Count	2	1		1	1	0		5
		Col. %	6.7%	6.7%		6.7%	9.1%	.0%		6.3%
	5	Count	4	0		2	0	1		7
		Col. %	13.3%	.0%		13.3%	.0%	20.0%		8.8%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Earlier, it was reported that most establishments in the survey (60%) had someone assigned to manage energy costs. However, Table 5.19 shows that only about 36% have any policy regarding purchases of energy efficient equipment. Furthermore, as seen in Table 5.20, if a company does have a policy, it is more likely to have informal guidelines rather than formal rules and specifications.

Table 5.19
Companies with Equipment Purchasing Policies

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Company has an equipment purchasing policy	We have a policy that requires the purchase of energy efficiency equipment	Count	1	0		0	1	0		2
		Col. %	3.3%	.0%		.0%	9.1%	.0%		2.4%
	We have a policy that states a preference for energy efficiency equipment	Count	12	3		4	2	4		27
		Col. %	40.0%	20.0%		26.7%	18.2%	80.0%		33.8%
	We do not have a policy regarding the energy efficiency of equipment	Count	17	12		11	8	1		51
		Col. %	56.7%	80.0%		73.3%	72.7%	20.0%		63.8%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.20
Types of Equipment Purchasing Policies

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Type of equipment purchasing policy	A formal set of written rules or specifications	Count	0	0		0	1	0		1
		Col. %	.0%	.0%		.0%	33.3%	.0%		3.4%
	An informal set of guidelines used by a number of people	Count	11	1		3	1	4		21
		Col. %	84.6%	33.3%		75.0%	33.3%	100.0%		72.4%
	Some combination of the above	Count	2	2		1	1	0		7
		Col. %	15.4%	66.7%		25.0%	33.3%	.0%		24.1%
Total		Count	13	3		4	3	4		29
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

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The survey asked follow-up questions to determine more detail about establishments' equipment purchasing policies. Table 5.21 shows that relatively few policies mention Energy Star labels (13.8%). In contrast, 69% of policies require financial analysis to justify an equipment purchase (see Table 5.22).

Table 5.21
Equipment Purchasing Policies Specifying Energy Star

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Policy mentions Energy Star labels	Yes	Count	2	0		1	0	1		4
		Col. %	15.4%	.0%		25.0%	.0%	25.0%		13.8%
	No	Count	11	3		3	3	3		25
		Col. %	84.6%	100.0%		75.0%	100.0%	75.0%		86.2%
Total		Count	13	3		4	3	4		29
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.22
Equipment Purchasing Policies Specifying Financial Analysis

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Policy includes financial analysis	Yes	Count	10	1		2	2	3		20
		Col. %	76.9%	33.3%		50.0%	66.7%	75.0%		69.0%
	No	Count	3	2		2	1	1		9
		Col. %	23.1%	66.7%		50.0%	33.3%	25.0%		31.0%
Total		Count	13	3		4	3	4		29
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

The survey asked companies to rate their agreement to a variety of statements regarding energy efficiency investments using a 1-5 scale where 1 means completely disagree and 5 means completely agree. They were also asked to rate the overall energy efficiency of their facilities using a 1-10 scale where 1 means not at all energy efficient and 10 means very energy efficient. An interesting finding shown in Table 5.23 is that companies are concerned that actual energy bill savings will be less than estimates. This concern is perhaps offset by the belief that there are other important benefits to energy efficiency investments besides saving money.

Table 5.23
Perceptions Regarding Energy Efficiency Investments

	Subsectors							
	Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	Total
Company has taken all cost-effective actions to reduce energy costs	2.6	2.5		2.9	3.2	2.8		2.8
Concerned that actual energy bill savings will be less than estimates	3.5	3.1		3.6	3.8	3.4		3.5
Takes too much time and hassle to make informed decisions regarding energy efficiency investments	2.8	2.7		3.1	2.5	2.6		2.8
Lack of financing is barrier to energy efficiency investments	3.0	2.2		2.9	2.4	3.2		2.7
There are other important benefits besides saving money that come with energy efficiency investments	3.7	3.8		3.7	3.8	3.8		3.7
Overall rating of facility's energy efficiency (1-10 scale)	5.9	5.7		5.8	6.5	5.2		5.9
Number of Respondents	29	15		14	11	5		77

Table 5.24 shows that companies believe that the main advantage to using energy efficient equipment is lower operating costs. However, purchasing decisions must weigh this advantage against the disadvantages of higher initial costs and lengthy payback period associated with energy efficient equipment (see Table 5.25). Table 5.25 also shows that reliability and incompatibility with industrial processes are other perceived disadvantages to energy efficient equipment.

Table 5.24
Perceived Advantages of Energy Efficient Equipment

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Main advantage to using energy efficient equipment	Lower operating costs	Count	19	8		11	8	3		52
		Col. %	65.5%	53.3%		78.6%	72.7%	60.0%		67.5%
	Longer equipment life	Count	4	0		0	0	0		4
		Col. %	13.8%	.0%		.0%	.0%	.0%		5.2%
	Better performance	Count	1	3		1	0	0		5
		Col. %	3.4%	20.0%		7.1%	.0%	.0%		6.5%
	Lower energy use	Count	3	4		1	1	2		11
		Col. %	10.3%	26.7%		7.1%	9.1%	40.0%		14.3%
	Other	Count	2	0		1	2	0		5
		Col. %	6.9%	.0%		7.1%	18.2%	.0%		6.5%
Total		Count	29	15		14	11	5		77
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.25
Perceived Disadvantages of Energy Efficient Equipment

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Main reason for not purchasing energy efficient equipment	Higher initial cost of efficient equipment	Count	8	3		2	3	2		18
		Col. %	27.6%	20.0%		14.3%	27.3%	40.0%		23.4%
	Too long a payback	Count	8	5		7	4	2		28
		Col. %	27.6%	33.3%		50.0%	36.4%	40.0%		36.4%
	Believe it is less reliable/doesn't perform as well	Count	4	1		1	1	1		9
		Col. %	13.8%	6.7%		7.1%	9.1%	20.0%		11.7%
	Efficient equipment not readily available	Count	1	3		1	0	0		5
		Col. %	3.4%	20.0%		7.1%	.0%	.0%		6.5%
	Efficient equipment not compatible in industrial process	Count	4	2		2	3	0		11
		Col. %	13.8%	13.3%		14.3%	27.3%	.0%		14.3%
	Other (combination of above reasons)	Count	4	1		1	0	0		6
		Col. %	13.8%	6.7%		7.1%	.0%	.0%		7.8%
Total		Count	29	15		14	11	5		77
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

4.75.7 TRAINING NEEDS AND DESIRES

The survey asked companies what types of support was needed by their organizations in order to increase their use of energy efficient equipment. About 25% of the respondents indicated the need for internal resources (personnel and money). Most reported the need for information and analysis to support the decision-making process. A few mentioned equipment needs. While the qualitative nature of these survey questions do not support any analysis by subsectors, survey responses are provided below:

Internal Resources

- Department of facility engineers
- Energy Engineer -- Full time
- Engineering
- Low-cost financing of equipment when equipment needs arise
- Manning
- Money
- More depth in project engineering - skills and people availability
- On-site maintenance engineer
- Personnel & budget
- Time to properly evaluate opportunities

Information and Analysis

- A support service group that would put out information in an easily understandable format, summarizing the types and benefits of high efficiency equipment
- Believable analysis & guarantees
- Company with high tech equipment to analyze heat loss & hot spots on wiring
- Cost/benefit analysis of maintenance vs. replacement of motors
- Education of what is available and case studies of successful installations
- Information
- Justification for changes to be made
- Know choices
- More information from suppliers
- Research
- Research and Information
- Someone to do a full energy use study
- Someone who could accurately quantify savings & advantages

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- Testing & reliable research that is certifiable
- Training -- need to be aware of what is available

Equipment

- Energy monitoring & reporting system (building management)
- Equipment available that is comparable to our business, cost, etc.
- Equipment would have to be available

About half of the respondents said that additional information and training would help their organizations increase their energy savings (see Table 5.26). They need to know what equipment is available specific to their types of operations. Hard data, such as credible cost/benefit analysis and case studies demonstrating success in other similar organizations, are needed to justify the investments. Respondents provided numerous other examples of information and training needs; these qualitative responses follow Table 5.26.

Table 5.26
Information and Training Needs

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Company would increase energy savings if more information or training were available	Yes	Count	18	8		4	6	3		39
		Col. %	60.0%	57.1%		30.8%	54.5%	60.0%		52.0%
	No	Count	12	6		9	5	2		36
		Col. %	40.0%	42.9%		69.2%	45.5%	40.0%		48.0%
Total		Count	30	14		13	11	5		75
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Information Needs

- A methodology to monitor savings
- Advances in motor specs
- Cost/savings
- Documentation of savings by other users of similar equipment
- Energy use of equipment, new or used.
- Equipment and processes available
- Examples of savings
- Implementation & maintenance
- Just need to be aware when something better is available - you may think you have the most efficient available when you really don't
- More audit help
- Practical data correlating to actual savings
- Practical guidelines for 1st level energy auditing
- Rules of thumb; case studies
- Specific modes with data on specifications
- Technical information
- Technology updates on analysis
- What is available as it relates to our business
- What the equipment is, how it compares to less efficient equipment, comparative costs, installation costs, return on investment

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- Who supplies the product & differences in performance of the equipment

Training Needs

- Ability to calculate savings given rates, etc.
- Awareness training
- Basic electrical training
- Best practices - especially on operation of high temperature tunnel kiln for ceramic industry
- Calculation of TRUE efficiencies & cash flow based returns
- Data gathering & interpretation
- Equipment measurement (operating data - electrical, thermal, etc)
- How to rate and read electrical specs on equipment as it relates to our energy supplier
- Knowledge of equipment available & benefits
- Practical guidelines on building air management
- Should be simply stated so that little training is necessary
- Technical training, knowledge of energy efficient motors that are available to fit their processes, training on what to look for when evaluating motor purchases
- What to look for -- examples from case studies, primarily electric and fuel oil for heat

On-site visits were conducted with six establishments as part of the assessment study. Surveys had been completed by three of these establishments prior to the on-site visits, one survey was completed during the on-site visit, and the remaining two surveys were returned about one week after the visits. Therefore, these six establishments are included in the survey results presented throughout this report. In addition, these in-depth interviews revealed a number of needs and interests presented below:

- There was widespread interest in receiving energy audit support, perhaps through an Industrial Assessment Center program run through the university.
- Basic electrical training to upgrade the skills of maintenance staff would be beneficial.
- Assistance with research and development efforts is needed, particularly in the areas of control systems, heat recovery, heat processing technologies, and process-specific operations.
- Companies using compressed air to operate line equipment would benefit from a compressed air survey that would identify the optimal configuration for balancing compressor load.
- Training and information regarding the latest advances in motor technologies are needed to make companies aware of the latest energy efficient motors that might be compatible with their operations.

4.85.8 FUTURE INDUSTRY TRENDS

Two-thirds of the companies surveyed expect that their use of equipment will stay about the same over the next 5 years (see Table 5.27). About 26% of the companies expect equipment use to increase over the next five years. This level of optimism is consistent across all subsectors. Companies expecting an increase or decrease over the next five years were asked to explain the reasons for the change. The list of responses (edited to eliminate redundancies) is provided following Table 5.27.

Table 5.27
Equipment Use in Next 5 Years

			Subsectors						Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	
Use of energy using equipment in next 5 years	Increase	Count	3	4		3	2	1	13
		Col. %	20.0%	36.4%		30.0%	25.0%	25.0%	26.0%
	Decrease	Count	2	0		1	1	0	4
		Col. %	13.3%	.0%		10.0%	12.5%	.0%	8.0%
	Stay about the same	Count	10	7		6	5	3	33
		Col. %	66.7%	63.6%		60.0%	62.5%	75.0%	66.0%
Total		Count	15	11		10	8	4	50
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%	100.0%

Reasons for increase:

- Added equipment
- Addition of new plant for new product line
- Business growth
- Increase in production
- More production allocated to this plant

Reasons for decrease:

- Closing down part of operations by 12/03
- Decreased raw product availability
- Major project coming to an end
- Replacement with more efficient systems

4.95.9 ENERGY USE BY FUEL AND END-USE

Table 5.28 reports the percentage of enclosed floor space that is heated and cooled. The Chemicals subsector has a higher percentage of conditioned floor space, especially during the heating season.

Table 5.28
Percent of Enclosed Floor Space that is Heated/Cooled

	Subsectors							Total
	Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Percentage of sq ft heated	42%	66%		84%	41%	64%		57%
Percentage of sq ft cooled	30%	31%		37%	18%	23%		30%
Number of Respondents	28	15		14	11	4		74

Respondents were asked how much energy by fuel type is consumed in a typical year by their facility. They were then asked to break down in percentage terms the total fuel consumption of each fuel by end use. It was anticipated that this would be a difficult task for respondents and the results confirmed this. Less than half of all respondents were willing and able to share this information. Table 5.29 reports the average consumption of each fuel type per facility and shows that Primary Metals, though small, is the most energy intensive subsector. Tables 5.30 through 5.35 show the distribution of fuel use by end use for each subsector.

Table 5.29
Average Energy Consumption per Facility*

	Subsectors							Total
	Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Electricity (kWh)	8,445,247 (11)	125,927,120 (4)		21,392,500 (4)	23,381,654 (6)	910,709,125 (3)		118,489,975 (30)
Natural Gas (mcf)	185,746 (9)	1,000,000 (1)		155,175 (2)	302,883 (6)	308,161 (3)		248,897 (23)
Propane/LP (gallons)	31,944 (4)	50,360 (2)		60,000 (1)	27,834 (4)			30,918 (13)
Fuel Oil (barrels)	28,729 (7)	5,172 (2)		130,000 (1)	1,667 (2)	126,934 (2)		39,929 (15)
Coal (short tons)		400,000 (1)						400,000 (1)
Wood (million Btu)		9,000 (1)						9,000 (1)
On-site Electricity Generated (kWh)	25,937,900 (2)	220,000,450 (2)						122,969,175 (4)

* Note: Number of respondents who reported consumption is enclosed in parentheses.

Note: Results for Forest Products are skewed by the presence of one very large paper mill. While the results after excluding this outlier cannot be shown because of confidentiality issues, average use for the Forest Products subsector is significantly lower without this paper mill.

Table 5.30
Electricity Consumption by End Use

	Subsectors							Total
	Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Boiler fuel	3%	0%		5%	0%	0%		2%
Process heating	6%	5%		14%	16%	4%		8%
Process cooling/refrigeration	24%	9%		12%	1%	0%		12%
Machine drive	37%	51%		34%	54%	16%		39%
Electro-chemical process	0%	0%		0%	0%	47%		4%
Other process uses	5%	11%		9%	17%	1%		9%
HVAC	12%	9%		18%	6%	31%		16%
Lighting	8%	5%		4%	4%	1%		7%
Other facility support	3%	11%		4%	2%	0%		5%
Onsite transportation	0%	1%		0%	0%	0%		0%
Onsite electricity generation	N/A	N/A		N/A	N/A	N/A		N/A
Number of Respondents	13	8		7	6	3		40

Table 5.31
Natural Gas Consumption by End Use

	Subsectors							Total
	Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Boiler fuel	40%	20%		60%	1%	63%		32%
Process heating	36%	70%		32%	71%	4%		42%
Process cooling/refrigeration	0%	0%		0%	0%	0%		0%
Machine drive	0%	10%		0%	0%	0%		1%
Electro-chemical process	N/A	N/A		N/A	N/A	N/A		N/A
Other process uses	10%	0%		0%	24%	32%		12%
HVAC	12%	0%		8%	1%	1%		11%
Lighting	N/A	N/A		N/A	N/A	N/A		N/A
Other facility support	0%	0%		0%	2%	0%		0%
Onsite transportation	0%	0%		0%	0%	0%		0%
Onsite electricity generation	2%	0%		0%	0%	0%		1%
Number of Respondents	11	3		4	6	3		29

Table 5.32
Propane Consumption by End Use

	Subsectors							Total
	Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Boiler fuel	3%	0%		0%	0%	0%		1%
Process heating	23%	1%		0%	0%	0%		6%
Process cooling/refrigeration	0%	0%		0%	0%	0%		0%
Machine drive	0%	0%		0%	0%	0%		0%
Electro-chemical process	N/A	N/A		N/A	N/A	N/A		N/A
Other process uses	0%	0%		50%	22%	0%		10%
HVAC	0%	19%		0%	0%	0%		6%
Lighting	N/A	N/A		N/A	N/A	N/A		N/A
Other facility support	25%	0%		0%	65%	0%		25%
Onsite transportation	50%	80%		50%	13%	0%		52%
Onsite electricity generation	0%	0%		0%	0%	0%		0%
Number of Respondents	4	5		2	3	0		16

Table 5.33
Fuel Oil Consumption by End Use

	Subsectors							Total
	Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Boiler fuel	43%	33%		40%	0%	96%		39%
Process heating	11%	0%		60%	50%	0%		21%
Process cooling/refrigeration	14%	0%		0%	0%	0%		6%
Machine drive	0%	0%		0%	0%	0%		0%
Electro-chemical process	N/A	N/A		N/A	N/A			N/A
Other process uses	0%	0%		0%	50%	0%		6%
HVAC	1%	0%		0%	0%	0%		0%
Lighting	N/A	N/A		N/A	N/A	N/A		N/A
Other facility support	0%	0%		0%	0%	0%		0%
Onsite transportation	28%	67%		0%	0%	5%		25%
Onsite electricity generation	15%	0%		0%	0%	0%		7%
Number of Respondents	7	3		1	2	2		16

Table 5.34
Coal Consumption by End Use

	Subsectors							Total
	Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Boiler fuel	0%	65%		0%	0%	0%		65%
Process heating	0%	0%		0%	0%	0%		0%
Process cooling/refrigeration	0%	0%		0%	0%	0%		0%
Machine drive	0%	0%		0%	0%	0%		0%
Electro-chemical process	N/A	N/A		N/A	N/A	N/A		N/A
Other process uses	0%	0%		0%	0%	0%		0%
HVAC	0%	0%		0%	0%	0%		0%
Lighting	N/A	N/A		N/A	N/A	N/A		N/A
Other facility support	0%	0%		0%	0%	0%		0%
Onsite transportation	N/A	N/A		N/A	N/A	N/A		N/A
Onsite electricity generation	0%	35%		0%	0%	0%		35%
Number of Respondents	0	1		0	0	0		1

Table 5.35
Wood Consumption by End Use

	Subsectors							Total
	Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Boiler fuel	0%	50%		0%	0%	0%		50%
Process heating	0%	0%		0%	0%	0%		0%
Process cooling/refrigeration	0%	0%		0%	0%	0%		0%
Machine drive	0%	0%		0%	0%	0%		0%
Electro-chemical process	N/A	N/A		N/A	N/A	N/A		N/A
Other process uses	0%	0%		0%	0%	0%		0%
HVAC	0%	50%		0%	0%	0%		50%
Lighting	N/A	N/A		N/A	N/A	N/A		N/A
Other facility support	0%	0%		0%	0%	0%		0%
Onsite transportation	N/A	N/A		N/A	N/A	N/A		N/A
Onsite electricity generation	0%	0%		0%	0%	0%		0%
Number of Respondents	0	2		0	0	0		2

As a point of comparison, Table 5.36 shows the average energy consumption per facility by industry and by end use for all industries and the subsectors of interest for the entire state of Maryland. These figures were derived from the Energy Information Administration's 1998 Manufacturing Energy Consumption Survey (MECS). The previous tables of energy consumption by industry and end use were based on a rather small sample size, which

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affects the stability of the estimates. The MECS study involved much larger sample sizes. This allows more detailed reporting at the sub-sector level. However, MECS results were only reported at the US and Census Region level. The data in Table 5.36 had to be calibrated to the State of Maryland by using the latest US Census Bureau Economic Census of Manufacturing (1997).

Table 5.36
Maryland Energy Consumption by Industry and by End Use

NAICS Code	End Use	Net Demand for Electricity (kWh)	Residual Fuel Oil (bbl)	Distillate Fuel Oil and Diesel Fuel (bbl)	Natural Gas (mcf)	LPG and NGL (bbl)	Coal (excluding Coal Coke and Breeze) (short tons)
311 - 339	ALL MANUFACTURING INDUSTRIES						
	AVERAGE FUEL CONSUMPTION	3,227,078	129	68	24,227	136	1
	Indirect Uses-Boiler Fuel	1%	74%	40%	40%	25%	73
	Direct Uses-Total Process	82%	26%	20%	51%	65%	23
	Process Heating	9%	26%	10%	49%	65%	23
	Process Cooling and Refrigeration	7%	0%	0%	0%	0%	0
	Machine Drive	56%	0%	10%	1%	0%	0
	Electro-Chemical Processes	11%	0%	0%	0%	0%	0
	Other Process Use	0%	0%	0%	1%	0%	0
	Direct Uses-Total Nonprocess	15%	0%	40%	7%	10%	5
	Facility HVAC	8%	0%	0%	3%	0%	0
	Facility Lighting	5%	0%	0%	0%	0%	0
	Other Facility Support	1%	0%	10%	0%	0%	0
	Onsite Transportation	0%	0%	30%	0%	10%	0
	Conventional Electricity Generation	0%	0%	0%	4%	0%	5
	Other Nonprocess Use	0%	0%	0%	0%	0%	0
	End Use Not Reported	2%	0%	0%	1%	0%	0
311	FOOD						
	AVERAGE FUEL CONSUMPTION	2,845,514	128	98	18,180	*	1
	Indirect Uses-Boiler Fuel	2%	100%	94%	61%		99
	Direct Uses-Total Process	83%	0%	0%	32%		0
	Process Heating	2%	0%	0%	30%		0
	Process Cooling and Refrigeration	27%	0%	0%	1%		0
	Machine Drive	54%	0%	0%	1%		0
	Electro-Chemical Processes	1%	0%	0%	0%		0
	Other Process Use	0%	0%	0%	1%		0
	Direct Uses-Total Nonprocess	16%	0%	5%	6%		1
	Facility HVAC	8%	0%	0%	3%		0
	Facility Lighting	6%	0%	0%	0%		0
	Other Facility Support	1%	0%	4%	1%		0
	Onsite Transportation	0%	0%	1%	0%		0
	Conventional Electricity Generation	0%	0%	0%	2%		1
	Other Nonprocess Use	0%	0%	0%	0%		0
	End Use Not Reported	0%	0%	0%	1%		0

5. Assessment Results...

NAICS Code	End Use	Net Demand for Electricity (kWh)	Residual Fuel Oil (bbl)	Distillate Fuel Oil and Diesel Fuel (bbl)	Natural Gas (mcf)	LPG and NGL (bbl)	Coal (excluding Coal Coke and Breeze) (short tons)
312	BEVERAGE AND TOBACCO PRODUCTS						
	AVERAGE FUEL CONSUMPTION	W	W	W	7,581	W	
	Indirect Uses-Boiler Fuel				73%		
	Direct Uses-Total Process				17%		
	Process Heating				17%		
	Process Cooling and Refrigeration				0%		
	Machine Drive				0%		
	Electro-Chemical Processes				0%		
	Other Process Use				0%		
	Direct Uses-Total Nonprocess				10%		
	Facility HVAC				5%		
	Facility Lighting				0%		
	Other Facility Support				0%		
	Onsite Transportation				0%		
	Conventional Electricity Generation				5%		
	Other Nonprocess Use				0%		
	End Use Not Reported				0%		
321	WOOD PRODUCTS						
	AVERAGE FUEL CONSUMPTION	1,111,314	*	65	2,859	30	
	Indirect Uses-Boiler Fuel	2%		16%	34%	31%	
	Direct Uses-Total Process	83%		1%	55%	69%	
	Process Heating	3%		0%	50%	69%	
	Process Cooling and Refrigeration	1%		0%	0%	0%	
	Machine Drive	78%		1%	0%	0%	
	Electro-Chemical Processes	1%		0%	0%	0%	
	Other Process Use	0%		0%	5%	0%	
	Direct Uses-Total Nonprocess	10%		83%	7%	0%	
	Facility HVAC	5%		0%	6%	0%	
	Facility Lighting	4%		0%	0%	0%	
	Other Facility Support	1%		7%	0%	0%	
	Onsite Transportation	0%		76%	0%	0%	
	Conventional Electricity Generation	0%		0%	1%	0%	
	Other Nonprocess Use	0%		0%	0%	0%	
	End Use Not Reported	4%		0%	3%	0%	

5. Assessment Results...

NAICS Code	End Use	Net Demand for Electricity (kWh)	Residual Fuel Oil (bbl)	Distillate Fuel Oil and Diesel Fuel (bbl)	Natural Gas (mcf)	LPG and NGL (bbl)	Coal (excluding Coal Coke and Breeze) (short tons)
322	PAPER						
	AVERAGE FUEL CONSUMPTION	23,100,732	3,400	238	103,911	*	2,8
	Indirect Uses-Boiler Fuel	2%	89%	90%	72%		97
	Direct Uses-Total Process	89%	11%	1%	21%		0
	Process Heating	0%	11%	0%	19%		0
	Process Cooling and Refrigeration	2%	0%	0%	0%		0
	Machine Drive	85%	0%	1%	2%		0
	Electro-Chemical Processes	1%	0%	0%	0%		0
	Other Process Use	0%	0%	0%	0%		0
	Direct Uses-Total Nonprocess	8%	0%	9%	7%		3
	Facility HVAC	4%	0%	0%	0%		0
	Facility Lighting	3%	0%	0%	0%		0
	Other Facility Support	1%	0%	7%	0%		0
	Onsite Transportation	0%	0%	2%	0%		0
	Conventional Electricity Generation	0%	0%	0%	7%		3
	Other Nonprocess Use	0%	0%	0%	0%		0
	End Use Not Reported	1%	0%	0%	0%		0
324	PETROLEUM AND COAL PRODUCTS						
	AVERAGE FUEL CONSUMPTION	3,108,381	112	110	76,941	251	
	Indirect Uses-Boiler Fuel	1%	59%	28%	28%	18%	
	Direct Uses-Total Process	94%	41%	45%	65%	82%	
	Process Heating	0%	41%	45%	63%	82%	
	Process Cooling and Refrigeration	5%	0%	0%	0%	0%	
	Machine Drive	88%	0%	0%	1%	0%	
	Electro-Chemical Processes	1%	0%	0%	0%	0%	
	Other Process Use	0%	0%	0%	0%	0%	
	Direct Uses-Total Nonprocess	6%	0%	26%	8%	0%	
	Facility HVAC	3%	0%	0%	0%	0%	
	Facility Lighting	2%	0%	0%	0%	0%	
	Other Facility Support	1%	0%	2%	0%	0%	
	Onsite Transportation	0%	0%	24%	0%	0%	
	Conventional Electricity Generation	0%	0%	0%	7%	0%	
	Other Nonprocess Use	0%	0%	0%	0%	0%	
	End Use Not Reported	0%	0%	0%	0%	0%	

5. Assessment Results...

NAICS Code	End Use	Net Demand for Electricity (kWh)	Residual Fuel Oil (bbl)	Distillate Fuel Oil and Diesel Fuel (bbl)	Natural Gas (mcf)	LPG and NGL (bbl)	Coal (excluding Coal Coke and Breeze) (short tons)
324110	Petroleum Refineries						
	AVERAGE FUEL CONSUMPTION	0	0	0	0	0	
	Indirect Uses-Boiler Fuel						
	Direct Uses-Total Process						
	Process Heating						
	Process Cooling and Refrigeration						
	Machine Drive						
	Electro-Chemical Processes						
	Other Process Use						
	Direct Uses-Total Nonprocess						
	Facility HVAC						
	Facility Lighting						
	Other Facility Support						
	Onsite Transportation						
	Conventional Electricity Generation						
	Other Nonprocess Use						
	End Use Not Reported						
325	CHEMICALS						
	AVERAGE FUEL CONSUMPTION	19,999,589	675	W	225,373	W	1,0
	Indirect Uses-Boiler Fuel	1%	67%		51%		97
	Direct Uses-Total Process	91%	33%		43%		0
	Process Heating	0%	33%		39%		C
	Process Cooling and Refrigeration	8%	0%		1%		C
	Machine Drive	62%	0%		1%		C
	Electro-Chemical Processes	20%	0%		0%		C
	Other Process Use	0%	0%		2%		C
	Direct Uses-Total Nonprocess	8%	0%		6%		3
	Facility HVAC	5%	0%		0%		C
	Facility Lighting	2%	0%		0%		C
	Other Facility Support	1%	0%		0%		C
	Onsite Transportation	0%	0%		0%		C
	Conventional Electricity Generation	0%	0%		6%		3
	Other Nonprocess Use	0%	0%		0%		C
	End Use Not Reported	0%	0%		0%		0

5. Assessment Results...

NAICS Code	End Use	Net Demand for Electricity (kWh)	Residual Fuel Oil (bbl)	Distillate Fuel Oil and Diesel Fuel (bbl)	Natural Gas (mcf)	LPG and NGL (bbl)	Coal (excluding Coal Coke and Breeze) (short tons)
327	NONMETALLIC MINERAL PRODUCTS						
	AVERAGE FUEL CONSUMPTION	2,548,945	*	116	27,524	*	5
	Indirect Uses-Boiler Fuel	0%		9%	6%		6
	Direct Uses-Total Process	87%		41%	88%		92
	Process Heating	22%		41%	87%		92
	Process Cooling and Refrigeration	3%		0%	0%		0
	Machine Drive	60%		0%	1%		0
	Electro-Chemical Processes	1%		0%	0%		0
	Other Process Use	1%		0%	0%		0
	Direct Uses-Total Nonprocess	9%		50%	3%		2
	Facility HVAC	5%		0%	1%		0
	Facility Lighting	4%		0%	0%		0
	Other Facility Support	1%		4%	0%		0
	Onsite Transportation	0%		45%	0%		0
	Conventional Electricity Generation	0%		0%	1%		2
	Other Nonprocess Use	0%		0%	0%		0
	End Use Not Reported	3%		0%	3%		0
3272	Glass and Glass Products						
	AVERAGE FUEL CONSUMPTION	W	0	*	23,058	*	
	Indirect Uses-Boiler Fuel				4%		
	Direct Uses-Total Process				93%		
	Process Heating				92%		
	Process Cooling and Refrigeration				0%		
	Machine Drive				1%		
	Electro-Chemical Processes				0%		
	Other Process Use				0%		
	Direct Uses-Total Nonprocess				2%		
	Facility HVAC				2%		
	Facility Lighting				0%		
	Other Facility Support				0%		
	Onsite Transportation				0%		
	Conventional Electricity Generation				1%		
	Other Nonprocess Use				0%		
	End Use Not Reported				1%		

5. Assessment Results...

NAICS Code	End Use	Net Demand for Electricity (kWh)	Residual Fuel Oil (bbl)	Distillate Fuel Oil and Diesel Fuel (bbl)	Natural Gas (mcf)	LPG and NGL (bbl)	Coal (excluding Coal Coke and Breeze) (short tons)
327310	Cements						
	AVERAGE FUEL CONSUMPTION	71,505,857	0	*	158,949	*	67,3
	Indirect Uses-Boiler Fuel	0%			5%		7
	Direct Uses-Total Process	96%			94%		90
	Process Heating	9%			90%		90
	Process Cooling and Refrigeration	2%			0%		0
	Machine Drive	83%			4%		0
	Electro-Chemical Processes	0%			0%		0
	Other Process Use	1%			0%		0
	Direct Uses-Total Nonprocess	4%			1%		3
	Facility HVAC	2%			0%		0
	Facility Lighting	2%			0%		0
	Other Facility Support	0%			0%		0
	Onsite Transportation	0%			0%		0
	Conventional Electricity Generation	0%			1%		3
	Other Nonprocess Use	0%			0%		0
	End Use Not Reported	0%			0%		0
331	PRIMARY METALS						
	AVERAGE FUEL CONSUMPTION	87,784,136	W	W	409,268	W	
	Indirect Uses-Boiler Fuel	0%			16%		
	Direct Uses-Total Process	93%			77%		
	Process Heating	28%			76%		
	Process Cooling and Refrigeration	1%			0%		
	Machine Drive	30%			0%		
	Electro-Chemical Processes	34%			0%		
	Other Process Use	0%			1%		
	Direct Uses-Total Nonprocess	6%			6%		
	Facility HVAC	3%			4%		
	Facility Lighting	2%			0%		
	Other Facility Support	0%			0%		
	Onsite Transportation	0%			0%		
	Conventional Electricity Generation	0%			2%		
	Other Nonprocess Use	0%			0%		
	End Use Not Reported	1%			1%		

5. Assessment Results...

NAICS Code	End Use	Net Demand for Electricity (kWh)	Residual Fuel Oil (bbl)	Distillate Fuel Oil and Diesel Fuel (bbl)	Natural Gas (mcf)	LPG and NGL (bbl)	Coal (excluding Coal Coke and Breeze) (short tons)
331111	Iron and Steel Mills						
	AVERAGE FUEL CONSUMPTION	1,810,311,594	W	W	11,267,852	*	
	Indirect Uses-Boiler Fuel	0%			12%		
	Direct Uses-Total Process	94%			83%		
	Process Heating	41%			81%		
	Process Cooling and Refrigeration	1%			0%		
	Machine Drive	49%			0%		
	Electro-Chemical Processes	2%			0%		
	Other Process Use	1%			1%		
	Direct Uses-Total Nonprocess	6%			5%		
	Facility HVAC	3%			2%		
	Facility Lighting	3%			0%		
	Other Facility Support	0%			1%		
	Onsite Transportation	0%			0%		
	Conventional Electricity Generation	0%			2%		
	Other Nonprocess Use	0%			0%		
	End Use Not Reported	0%			0%		
3312	Steel Products from Purchased Steel						
	AVERAGE FUEL CONSUMPTION	6,904,949	0	*	21,121	*	
	Indirect Uses-Boiler Fuel	0%			14%		
	Direct Uses-Total Process	84%			68%		
	Process Heating	19%			68%		
	Process Cooling and Refrigeration	2%			0%		
	Machine Drive	61%			0%		
	Electro-Chemical Processes	3%			0%		
	Other Process Use	0%			0%		
	Direct Uses-Total Nonprocess	13%			19%		
	Facility HVAC	5%			18%		
	Facility Lighting	6%			0%		
	Other Facility Support	1%			0%		
	Onsite Transportation	0%			0%		
	Conventional Electricity Generation	0%			0%		
	Other Nonprocess Use	0%			0%		
	End Use Not Reported	3%			0%		

5. Assessment Results...

NAICS Code	End Use	Net Demand for Electricity (kWh)	Residual Fuel Oil (bbl)	Distillate Fuel Oil and Diesel Fuel (bbl)	Natural Gas (mcf)	LPG and NGL (bbl)	Coal (excluding Coal Coke and Breeze) (short tons)
3313	Alumina and Aluminum						
	AVERAGE FUEL CONSUMPTION	266,978,069	0	W	1,156,081	*	
	Indirect Uses-Boiler Fuel	0%			25%		
	Direct Uses-Total Process	97%			72%		
	Process Heating	10%			72%		
	Process Cooling and Refrigeration	1%			0%		
	Machine Drive	14%			0%		
	Electro-Chemical Processes	72%			0%		
	Other Process Use	0%			0%		
	Direct Uses-Total Nonprocess	2%			3%		
	Facility HVAC	2%			0%		
	Facility Lighting	1%			0%		
	Other Facility Support	0%			0%		
	Onsite Transportation	0%			0%		
	Conventional Electricity Generation	0%			2%		
	Other Nonprocess Use	0%			0%		
	End Use Not Reported	0%			0%		
3315	Foundries						
	AVERAGE FUEL CONSUMPTION	1,194,696	*	W	4,252	*	
	Indirect Uses-Boiler Fuel	0%			1%		
	Direct Uses-Total Process	83%			83%		
	Process Heating	49%			82%		
	Process Cooling and Refrigeration	2%			0%		
	Machine Drive	30%			1%		
	Electro-Chemical Processes	1%			0%		
	Other Process Use	0%			0%		
	Direct Uses-Total Nonprocess	14%			16%		
	Facility HVAC	8%			15%		
	Facility Lighting	5%			0%		
	Other Facility Support	1%			1%		
	Onsite Transportation	0%			0%		
	Conventional Electricity Generation	0%			0%		
	Other Nonprocess Use	0%			0%		
	End Use Not Reported	2%			1%		

* = Estimate less than 0.5

W = Withheld to avoid disclosing data for individual establishments.

Source: 1998 Manufacturing Energy Consumption Survey, Energy Information Administration, US Department of Energy. 1997 Economic Census of Manufacturing, US Census Bureau

4.105.10 ENERGY INTENSITY

Based on our survey results, Table 5.37 shows energy intensities by subsector for each fuel type expressed in terms of energy consumption divided by annual revenue, number of employees, and square footage. These energy intensities need to be viewed as rough estimates for two reasons. First, as addressed earlier, the energy consumption numbers are based on a limited number of respondents. Second, revenue, employee, and square footage data were collected on the survey using category-based responses, which are less precise than actual numeric responses. This approach was taken to reduce demands on the respondents and increase the likelihood that respondents would provide this sensitive information. In order to calculate energy intensities, categorical responses first were converted into point estimates by centering the category. For example, if respondent indicated the company revenues were somewhere between \$500-\$999K, the response was converted to \$750K.

Table 5.37
Energy Intensities

	Subsectors							
	Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	Total
Electric								
(kWh/\$1K Revenue)	232.5	492.5		226.1	493.6	3,327.5		626.5
(kWh/Employees)	56,985.1	57,307.4		108,472.4	274,942.4	1,299,193.1		228,258.7
(kWh/SqFt)	115.5	1,719.4		789.2	512.0	9,172.0		1,385.6
Natural Gas								
(mcf/\$1K Revenue)	4.2	.6		.1	12.7	3.0		4.2
(mcf/Employees)	731.2	55.6		165.7	2,226.6	1,480.9		837.5
(mcf/SqFt)	2.4	1.7		.6	2.6	4.6		2.0
Propane								
(gallons/\$1K Revenue)	.4	.1		.1	.4	.0		.3
(gallons/Employees)	193.6	7.5		57.1	104.6	.0		98.6
(gallons/SqFt)	.1	.2		.6	.2	.0		.2
Oil								
(barrels/\$1K Revenue)	.8	.0		.2	.0	2.3		.5
(barrels/Employees)	161.3	1.6		106.1	2.8	519.2		117.9
(barrels/SqFt)	.3	.0		1.1	.0	.9		.4
Coal								
(short tons/\$1K Revenue)	.0	.2		.0	.0	.0		.0
(short tons/Employees)	.0	22.2		.0	.0	.0		3.7
(short tons/SqFt)	.0	.7		.0	.0	.0		.1
Wood								
(million Btu/\$1K Revenue)	.0	.1		.0	.0	.0		.0
(million Btu/Employees)	.0	24.0		.0	.0	.0		3.4
(million Btu/SqFt)	.0	.2		.0	.0	.0		.0

4.145.11 WILLINGNESS TO TAKE THE LEAD AS A STATE IOF CHAMPION

Given the fact that the IOF program is still in its early stages of development, it was premature to ask in a survey whether or not a company and its representatives were willing to take a lead in the program. Instead, the survey included questions designed to gauge overall interest in the program and the upcoming Forum. Table 5.38 shows that about 77% of those surveyed are at least somewhat interested in the IOF program. Furthermore, nearly 60% are interested in attending the IOF Forum (see Table 5.39). The survey asked respondents to explain the reason for their level of interest in the IOF program. These qualitative responses (edited to eliminate redundancies) are provided after Table 5.39.

Table 5.38
Interest in the IOF Program

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Interest in IOF	Not interested	Count	6	4		3	2	0		18
		Col. %	20.0%	26.7%		20.0%	18.2%	.0%		22.5%
	Somewhat interested	Count	15	7		11	6	4		44
		Col. %	50.0%	46.7%		73.3%	54.5%	80.0%		55.0%
	Very interested	Count	9	4		1	3	1		18
		Col. %	30.0%	26.7%		6.7%	27.3%	20.0%		22.5%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.39
Interest in Attending IOF Forum

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Interest in IOF Forum	Yes	Count	20	8		8	6	4		46
		Col. %	66.7%	53.3%		53.3%	54.5%	80.0%		57.5%
	No	Count	10	7		7	5	1		34
		Col. %	33.3%	46.7%		46.7%	45.5%	20.0%		42.5%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

5. Assessment Results...

Reasons provided by those not interested:

- Doesn't fit our situation
- Energy is handled by landlord
- I don't think we can save any money
- IOF doesn't sound to be top-priority
- No time. Energy is not a priority
- Not a big overall factor -- efficiency & productivity are main concerns when purchasing equipment
- Very small company & energy uses are relatively small compared to industry standards. Limited types of equipment that we can use

Reasons provided by those somewhat interested:

- Curiosity
- Don't feel I have company support
- Environmental reasons
- Exploring the possibilities of saving money is always welcome
- I believe we are doing a fair job concerning our energy needs
- Interested in saving energy but don't want to interrupt production process to educate the educators
- Interested to see what is planned, but do not feel we would pursue
- It can reduce energy costs of plant
- May not have resources to implement savings
- Not sure if that service is what is required at this facility
- Not sure of any savings
- Not sure of program or potential cost
- Not sure what it involves
- Our energy requirements are not high
- Potential to reduce costs & learn about the latest technologies in motors
- Probability of success
- Proprietary
- Small manufacturing business with limited areas for large savings
- Time constraints and other projects
- To reduce operating costs

5. Assessment Results...

- To save dollars
- Unsure of practical applications to our facility
- Unsure of timing required
- We are a young business and we are always looking to improve our practices
- We would like to reduce usage

Reasons provided by those very interested:

- Always looking for opportunities to improve
- Always looking for ways to save energy & money
- Currently don't have an energy efficiency program
- Not an IOF industry, but interested in best practices
- Opportunities exist - budgeted funds and manpower doesn't
- Opportunity to be more efficient in consumption
- Very energy intensive process, interested in R&D in control systems, heat recovery & heat processing
- We do have agreements with BGE - energy monitoring on their website from our server in our sub-station
- We might be able to decrease operating expenses

4.125.12 OTHER BUSINESS CHARACTERISTICS

The survey collected data on a variety of other business characteristics. Tables 5.40 through 5.51 summarize this information.

Table 5.40
Annual Operating Expenses

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Annual operating expenses	Under \$500K	Count	1	0		2	0	0		4
		Col. %	3.8%	.0%		15.4%	.0%	.0%		5.7%
	\$500-\$999K	Count	2	0		2	0	0		4
		Col. %	7.7%	.0%		15.4%	.0%	.0%		5.7%
	\$1MM-\$4.9MM	Count	11	5		3	5	1		27
		Col. %	42.3%	38.5%		23.1%	50.0%	20.0%		38.6%
	\$5MM-\$9.9MM	Count	3	5		2	1	1		12
		Col. %	11.5%	38.5%		15.4%	10.0%	20.0%		17.1%
	\$10MM-\$24.9MM	Count	5	2		1	1	1		10
		Col. %	19.2%	15.4%		7.7%	10.0%	20.0%		14.3%
	\$25MM-\$49.9MM	Count	1	0		1	3	1		6
		Col. %	3.8%	.0%		7.7%	30.0%	20.0%		8.6%
	\$50MM-\$99.9MM	Count	2	0		0	0	0		2
		Col. %	7.7%	.0%		.0%	.0%	.0%		2.9%
	\$100MM-\$499.9MM	Count	1	1		2	0	1		5
		Col. %	3.8%	7.7%		15.4%	.0%	20.0%		7.1%
Total		Count	26	13		13	10	5		70
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.41
Number of Buildings at Facility

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Number of buildings occupied	1	Count	14	6		8	5	1		38
		Col. %	46.7%	42.9%		53.3%	45.5%	20.0%		47.5%
	2	Count	5	1		3	2	2		14
		Col. %	16.7%	7.1%		20.0%	18.2%	40.0%		17.5%
	3	Count	0	0		1	0	0		1
		Col. %	.0%	.0%		6.7%	.0%	.0%		1.3%
	4	Count	4	1		0	3	1		9
		Col. %	13.3%	7.1%		.0%	27.3%	20.0%		11.3%
	5	Count	2	2		0	0	0		4
		Col. %	6.7%	14.3%		.0%	.0%	.0%		5.0%
	6	Count	1	0		2	0	0		3
		Col. %	3.3%	.0%		13.3%	.0%	.0%		3.8%
	7	Count	1	0		0	1	0		2
		Col. %	3.3%	.0%		.0%	9.1%	.0%		2.5%
	10	Count	0	0		1	0	0		1
		Col. %	.0%	.0%		6.7%	.0%	.0%		1.3%
	11	Count	1	1		0	0	0		2
		Col. %	3.3%	7.1%		.0%	.0%	.0%		2.5%
	15	Count	0	1		0	0	0		1
		Col. %	.0%	7.1%		.0%	.0%	.0%		1.3%
	18	Count	1	1		0	0	0		2
		Col. %	3.3%	7.1%		.0%	.0%	.0%		2.5%
	20	Count	1	0		0	0	1		2
		Col. %	3.3%	.0%		.0%	.0%	20.0%		2.5%
	25	Count	0	1		0	0	0		1
		Col. %	.0%	7.1%		.0%	.0%	.0%		1.3%
Total		Count	30	14		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

5. Assessment Results...

Table 5.42
Amount of Building(s) Occupied at Facility

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Amount of building(s) occupied	Entire building(s)	Count	26	13		10	10	5		67
		Col. %	86.7%	86.7%		66.7%	90.9%	100.0%		83.8%
	A portion of the building(s)	Count	4	2		5	1	0		13
		Col. %	13.3%	13.3%		33.3%	9.1%	.0%		16.2%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.43
Building Ownership Rates

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Own or lease	Own the entire portion of the space that it occupies	Count	20	11		8	6	4		52
		Col. %	66.7%	73.3%		53.3%	54.5%	80.0%		63.8%
	Lease the portion of the space that it occupies	Count	9	4		7	5	0		26
		Col. %	30.0%	26.7%		46.7%	45.5%	.0%		32.5%
	Own a part and lease the remainder	Count	1	0		0	0	1		2
		Col. %	3.3%	.0%		.0%	.0%	20.0%		2.5%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Note: Of the 28 companies leasing at least part of their facilities, only one reported that the landlord pays all electric bills directly

Table 5.44
Number of Operating Days

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Number of days per week in operation	4	Count	1	2		0	0	0		3
		Col. %	3.3%	13.3%		.0%	.0%	.0%		3.8%
	5	Count	12	6		13	4	2		41
		Col. %	40.0%	40.0%		86.7%	36.4%	40.0%		51.3%
	6	Count	12	5		1	1	2		21
		Col. %	40.0%	33.3%		6.7%	9.1%	40.0%		26.3%
	7	Count	5	2		1	6	1		15
		Col. %	16.7%	13.3%		6.7%	54.5%	20.0%		18.8%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.45
Number of Operating Shifts

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Number of shifts	One	Count	16	8		11	4	1		42
		Col. %	53.3%	53.3%		73.3%	36.4%	20.0%		53.8%
	Two	Count	5	4		1	3	0		13
		Col. %	16.7%	26.7%		6.7%	27.3%	.0%		16.3%
	Three	Count	9	2		3	3	4		22
		Col. %	30.0%	13.3%		20.0%	27.3%	80.0%		27.5%
	Four	Count	0	1		0	1	0		2
		Col. %	.0%	6.7%		.0%	9.1%	.0%		2.5%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.46
Operational Differences Between Shifts

			Subsectors						Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	
Type of work on each shift	Same work is performed on all shifts	Count	7	6		2	3	4	22
		Col. %	50.0%	85.7%		50.0%	42.9%	100.0%	59.5%
	Work functions vary with the time of day	Count	7	1		2	4	0	15
		Col. %	50.0%	14.3%		50.0%	57.1%	.0%	40.5%
Total		Count	14	7		4	7	4	37
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%	100.0%

Table 5.47
Facility Age

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
When building(s) were built	Within the last two years	Count	1	0		0	0	0		1
		Col. %	3.3%	.0%		.0%	.0%	.0%		1.2%
	Between 3 and 5 years ago	Count	1	0		0	0	0		1
		Col. %	3.3%	.0%		.0%	.0%	.0%		1.2%
	Between 6 and 10 years ago	Count	4	3		1	2	0		11
		Col. %	13.3%	20.0%		6.7%	18.2%	.0%		13.8%
	Between 11 and 20 years ago	Count	6	6		3	0	0		15
		Col. %	20.0%	40.0%		20.0%	.0%	.0%		18.8%
	Longer than 20 years ago	Count	18	6		11	9	5		52
		Col. %	60.0%	40.0%		73.3%	81.8%	100.0%		65.0%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.48
Length of Time at Facility

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
When company moved into building(s)	Within the last two years	Count	1	0		0	0	0		1
		Col. %	3.3%	.0%		.0%	.0%	.0%		1.2%
	Between 3 and 5 years ago	Count	3	1		4	1	0		10
		Col. %	10.0%	6.7%		26.7%	9.1%	.0%		12.5%
	Between 6 and 10 years ago	Count	7	3		2	2	0		15
		Col. %	23.3%	20.0%		13.3%	18.2%	.0%		18.8%
	Between 11 and 20 years ago	Count	7	6		2	1	1		18
		Col. %	23.3%	40.0%		13.3%	9.1%	20.0%		22.5%
	Longer than 20 years ago	Count	12	5		7	7	4		36
		Col. %	40.0%	33.3%		46.7%	63.6%	80.0%		45.0%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.49
Number of Facilities Nation-wide

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Number of facilities nationwide	1 (This is the only facility)	Count	14	9		8	3	2		39
		Col. %	46.7%	60.0%		53.3%	27.3%	40.0%		48.8%
	2	Count	2	4		2	0	0		8
		Col. %	6.7%	26.7%		13.3%	.0%	.0%		10.0%
	3-4	Count	1	1		2	1	0		5
		Col. %	3.3%	6.7%		13.3%	9.1%	.0%		6.3%
	5-6	Count	2	0		0	1	0		3
		Col. %	6.7%	.0%		.0%	9.1%	.0%		3.7%
	7-9	Count	1	0		1	1	0		3
		Col. %	3.3%	.0%		6.7%	9.1%	.0%		3.7%
	10+	Count	10	1		2	5	3		22
		Col. %	33.3%	6.7%		13.3%	45.5%	60.0%		27.5%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.50
Types of New Electricity Contracts

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Electricity under new contract	My company accepted a standard offer contract	Count	2	2		1	0	0		5
		Col. %	6.7%	13.3%		6.7%	.0%	.0%		6.3%
	My company renegotiated a new contract for electricity	Count	6	4		5	4	1		20
		Col. %	20.0%	26.7%		33.3%	36.4%	20.0%		25.0%
	My company was not offered an opportunity to obtain electricity under a new contract	Count	20	9		9	7	3		51
		Col. %	66.7%	60.0%		60.0%	63.6%	60.0%		63.8%
	Other	Count	2	0		0	0	1		4
		Col. %	6.7%	.0%		.0%	.0%	20.0%		5.0%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

Table 5.51
Respondent Title

			Subsectors							Total
			Food Processing	Forest Products	Petroleum	Chemicals	Nonmetallic Mineral Products	Primary Metals	Other	
Respondent title	Chief Engineer	Count	3	0		0	0	0		3
		Col. %	10.0%	.0%		.0%	.0%	.0%		3.8%
	Energy Manager	Count	4	0		0	0	1		5
		Col. %	13.3%	.0%		.0%	.0%	20.0%		6.2%
	Facility Manager	Count	2	1		1	1	1		6
		Col. %	6.7%	6.7%		6.7%	9.1%	20.0%		7.4%
	Operations Manager	Count	2	3		2	1	0		8
		Col. %	6.7%	20.0%		13.3%	9.1%	.0%		10.0%
	Maintenance Supervisor	Count	0	1		0	0	1		2
		Col. %	.0%	6.7%		.0%	.0%	20.0%		2.5%
	Plant Engineer	Count	2	0		0	0	0		2
		Col. %	6.7%	.0%		.0%	.0%	.0%		2.5%
	Plant Manager	Count	6	2		2	5	1		16
		Col. %	20.0%	13.3%		13.3%	45.5%	20.0%		20.0%
	Director of Operations, Manufacturing, Engineering	Count	0	0		3	1	0		4
		Col. %	.0%	.0%		20.0%	9.1%	.0%		5.0%
	Vice-President of Operations	Count	4	1		1	0	0		7
		Col. %	13.3%	6.7%		6.7%	.0%	.0%		8.8%
	Other	Count	7	7		6	3	1		27
		Col. %	23.3%	46.7%		40.0%	27.3%	20.0%		33.8%
Total		Count	30	15		15	11	5		80
		Col. %	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%

APPENDIX A: SURVEY INSTRUMENTS

A.1 COVER LETTER

Note: Fields enclosed with brackets were automatically filled with information from the DBED database when document was printed on MEA letterhead.

Dear [Name]:

The U.S. Department of Energy's Industrial Technologies program is working with the Maryland Energy Administration and other state partners on energy-focused research that is critical to Maryland's economy. The goal of this initiative, known as Industries of the Future (IOF), is to motivate and assist industry in developing technology solutions for critical energy, environmental, and economic challenges. The State IOF is currently conducting energy efficiency and management training for IOF industries. It is also organizing a Maryland IOF steering committee and industry working groups. Companies participating in the Maryland IOF will have access to future training programs, BestPractices training, potential Research & Development funding partnerships, and Energy Assessment Services.

One of the initial activities includes a detailed assessment of Maryland's food processing, forest products, petroleum, nonmetallic mineral products, and primary metals industries. This assessment is an important study on the energy needs and perceptions of industrial firms in the state, and how firms like yours think about and manage energy costs. We have hired PA Government Services, a professional research and consulting firm, to help design and conduct this assessment on our behalf. The results of the survey will be used to allocate the resources of the Maryland IOF program for energy efficiency activities in these important industry sectors.

The person who is most knowledgeable about decisions affecting your energy using equipment at the following location should complete the enclosed survey:

**[Address]
[City], [State] [ZIP]**

This survey should about 15 minutes to complete. You can be assured that the results of this survey will remain confidential with the Maryland Energy Administration. Individual-level data will not be reported. Data will be aggregated to the industrial sector level. Sector-level data will only be reported if 5 or more establishments from the same sector respond to the survey.

If you have any questions about the purpose of the study or its use, please contact Charles Miller at (410) 260-7190. If you have any questions about completing the survey and would like to call PA Government Services please call Bryan Zent at (608) 827-7820. Completed surveys should be returned to PA Government Services. A stamped, addressed envelope has been included for your convenience.

Thank you in advance for your help with this important study!

Sincerely,



Frederick H. Hoover
Director



Charles L. Miller, Jr.
Research Manager

A.2 MAIL SURVEY

Maryland Industries of the Future Survey

This survey should be completed by the person who is most knowledgeable about decisions affecting your energy using equipment at the location listed in the attached cover letter. If you have any questions while completing this survey, please call Bryan Zent of PA Government Services at (608) 827-7820.

Background

A1 What is the principal activity conducted at the facility listed in the cover letter? This may not be the main activity of your organization, but should be the main activity that occurs at this location. *(CIRCLE ONE NUMBER)*

- 1 Food (Food Processing)
- 2 Beverage and Tobacco Products (Food Processing)
- 3 Wood Products (Forest Products)
- 4 Paper (Forest Products)
- 5 Petroleum and Coal Products (Petroleum)
- 6 Glass and Glass Products (Nonmetallic Mineral Products)
- 7 Cements (Nonmetallic Mineral Products)
- 8 Other Nonmetallic Mineral Products
- 9 Iron and Steel Mills (Primary Metals)
- 10 Steel Products from Purchased Steel (Primary Metals)
- 11 Alumina and Aluminum (Primary Metals)
- 12 Foundries (Primary Metals)
- 13 Other Primary Metals
- 14 Other [PLEASE DESCRIBE: _____]

A2 What kinds of operations or processes occur at this location? What are the products made through these processes? *(FILL IN BLANK)*

A3 What is the approximate annual revenue or sales of the products or services your organization provides at this location? *(CIRCLE ONE NUMBER)*

- 1 Under \$500K
- 2 \$500-\$999K
- 3 \$1MM-\$4.9MM
- 4 \$5MM-\$9.9MM
- 5 \$10MM-\$24.9MM
- 6 \$25MM-\$49.9MM
- 7 \$50MM-\$99.9MM
- 8 \$100MM-\$499.9MM
- 9 \$500MM-\$999.9MM

A: Survey Instruments...

- 10 \$1B+
- A4 What are your organization's total annual operating expenses at this location (including labor, rent, materials, and other overhead expenses)? *(CIRCLE ONE NUMBER)*
- 1 Under \$500K
 - 2 \$500-\$999K
 - 3 \$1MM-\$4.9MM
 - 4 \$5MM-\$9.9MM
 - 5 \$10MM-\$24.9MM
 - 6 \$25MM-\$49.9MM
 - 7 \$50MM-\$99.9MM
 - 8 \$100MM-\$499.9MM
 - 9 \$500MM-\$999.9MM
 - 10 \$1B+
- A5 Does your firm occupy space in more than one building at this location? *(CIRCLE ONE NUMBER)*
- 1 Yes--→How many buildings do you occupy? _____
 - 2 No
- A6 Does your firm occupy the entire building(s) or just a portion of the building(s) at this location? *(CIRCLE ONE NUMBER)*
- 1 Entire building(s)
 - 2 A portion of the building(s)
- A7 Does your firm . . .? *(CIRCLE ONE NUMBER)*
- 1 Own the entire portion of the space that it occupies
 - 2 Lease the portion of the space that it occupies
 - 3 Own a part and lease the remainder
- A8 What is the approximate total enclosed square footage of the building(s) you occupy at this address? Your best estimate will be fine. Include in this estimate all the area enclosed by the exterior walls of the building, such as indoor parking facilities, basements, hallways, lobbies, stairways, and elevator shafts. *(CIRCLE ONE NUMBER)*
- 1 Under 1,000
 - 2 1,000-4,999
 - 3 5,000-9,999
 - 4 10,000-24,999
 - 5 25,000-49,999
 - 6 50,000-99,999
 - 7 100,000+

A: Survey Instruments...

- A9 What are you business's normal operating hours at this location? This would be when most employees are present, not when only security or cleaning staff are present. *(FILL IN BLANKS)*

Monday	_____	AM/PM	to	_____	AM/PM
Tuesday	_____	AM/PM	to	_____	AM/PM
Wednesday	_____	AM/PM	to	_____	AM/PM
Thursday	_____	AM/PM	to	_____	AM/PM
Friday	_____	AM/PM	to	_____	AM/PM
Saturday	_____	AM/PM	to	_____	AM/PM
Sunday	_____	AM/PM	to	_____	AM/PM

- A10 How many shifts per day does your business normally operate at this location? *(CIRCLE ONE NUMBER)*

- 1 One
- 2 Two
- 3 Three

- A11 (If facility operates on multiple shifts) Is the same work performed on all shifts or do the functions vary with the time of day? *(CIRCLE ONE NUMBER)*

- 1 Same work is performed on all shifts
- 2 Work functions vary with the time of day

- A12 Approximately how many full-time employees work for your company at this location? *(CIRCLE ONE NUMBER)*

- 1 less than 20
- 2 20-49
- 3 50-99
- 4 100-249
- 5 250-499
- 6 500-999
- 7 1,000-4,999
- 8 5,000 or more

- A13 Approximately how many part-time and seasonal employees work for your company at this location? *(CIRCLE ONE NUMBER)*

- 1 less than 20
- 2 20-49
- 3 50-99
- 4 100-249
- 5 250-499
- 6 500-999
- 7 1,000-4,999
- 8 5,000 or more

A: Survey Instruments...

A14 When was the building(s) you occupy at this facility built? Would you say it was . . . ?
(CIRCLE ONE NUMBER)

- 1 Within the last two years
- 2 Between 3 and 5 years ago
- 3 Between 6 and 10 years ago
- 4 Between 11 and 20 years ago
- 5 Longer than 20 years ago

A15 When did your company move into this building(s)? (CIRCLE ONE NUMBER)

- 1 Within the last two years
- 2 Between 3 and 5 years ago
- 3 Between 6 and 10 years ago
- 4 Between 11 and 20 years ago
- 5 Longer than 20 years ago

A16 If your company leases the property at this facility, is your company billed directly for your electricity usage or is the bill paid by a landlord or property manager? (CIRCLE ONE NUMBER)

- 1 Billed directly
- 2 Landlord/property manager

A17 How many separate facilities does your company have nationwide including this location? (CIRCLE ONE NUMBER)

- 1 1 (This is the only facility)
- 2 2
- 3 3-4
- 4 5-6
- 5 7-9
- 6 10+

A18 If your company was offered an opportunity to obtain electricity under a new contract, which of the following statements is true? (CIRCLE ONE NUMBER)

- 1 My company accepted a standard offer contract
- 2 My company renegotiated a new contract for electricity
- 3 My company was not offered an opportunity to obtain electricity under a new contract
- 4 Other [PLEASE DESCRIBE: _____]

Energy Management Responsibilities

B1 Is there a person, group or department in your organization that is assigned by top management to manage energy use and costs? (CIRCLE ONE NUMBER)

- 1 Yes, one person
- 2 Yes, a group
- 3 Yes, a department
- 4 No

A: Survey Instruments...

B2 Is there an annual budget assigned to energy management activities? (*CIRCLE ONE NUMBER*)

- 1 Yes
- 2 No

B3 Does your company have energy cost reduction goals? (*CIRCLE ONE NUMBER*)

- 1 Yes
- 2 No

B4 Are there persons in your organization who have been assigned responsibility for . . . ?
(*CIRCLE ONE NUMBER FOR EACH QUESTION*)

tracking energy use or costs over time for the facility as a whole?	1 Yes	2 No
monitoring energy use for key building or process systems?	1 Yes	2 No
identifying facility improvements to reduce energy use and costs?	1 Yes	2 No
qualifying potential energy efficiency improvements in terms of costs and returns on investment?	1 Yes	2 No
controlling or reducing peak electrical demand for the facility?	1 Yes	2 No
controlling or reducing peak electrical demand for specific buildings and equipment?	1 Yes	2 No

B5 (IF NO TO ALL IN B4) What is the MAIN reason you company has not assigned staff to energy management activities? (*CIRCLE ONE NUMBER*)

- 1 Energy costs aren't that large of an expense
- 2 We have more important priorities for our staff resources
- 3 Staff do not have the skills/knowledge to do this
- 4 No cash available for this
- 5 We outsource facility management
- 6 Other [PLEASE DESCRIBE: _____]

B6 How many years has it been since your organization has conducted a complete energy audit at this facility? (*FILL IN BLANK; IF NEVER, ENTER ZERO*)

_____ years

B7 In the past two years, how many major renovations, additions or remodeling at this location involving expenditures of \$10,000 or more for a single project has your organization undertaken at this facility? (*FILL IN BLANK*)

_____ (IF NONE, SKIP TO B9)

B8 [Was this project/Were any of these projects] undertaken with the primary objective of reducing energy costs in the facility? (*CIRCLE ONE NUMBER*)

- 1 Yes
- 2 No

A: Survey Instruments...

- B9 Businesses differ in the ways they make decisions about equipment purchases. The first column in the following table lists various titles of individuals who might be involved in the equipment purchasing decisions at this location.

In column 2, please indicate everyone who is responsible for recommending the types and efficiency levels of energy using equipment purchased for this location. (*CHECK ALL THAT APPLY*)

In column 3, please indicate everyone who approves the actual equipment purchases. (*CHECK ALL THAT APPLY*)

Finally in columns 4 and 5, if a person's approval authority is limited to certain types of equipment or limited by a not-to-exceed dollar amount, please describe these limitations. (*FILL IN BLANKS*)

1	2	3	4	5
Position	Recom- mends	Approves	Equipment Limitations	Dollar Limitations (Approval up to \$X)
President/CEO				
CFO/Comptroller				
Purchasing Department				
Building Manager or Engineer				
Energy Manager				
Line/Production Manager				
Landlord				
Contractor				
Other (Title: _____)				

- B10 Which of the following best describes your organization's policy regarding the purchase of energy using products? (*CIRCLE ONE NUMBER*)

- 1 We have a policy that requires the purchase of energy efficient equipment
- 2 We have a policy that states a preference for energy efficiency equipment
- 3 We do not have a policy regarding the energy efficiency of equipment purchases→ (*SKIP TO B14*)

- B11 Is this policy . . . ? (*CIRCLE ONE NUMBER*)

- 1 A formal set of written rules or specifications
- 2 An informal set of guidelines used by a number of people
- 3 Some combination of the above

- B12 Does this policy mention Energy Star labeled equipment? (*CIRCLE ONE NUMBER*)

- 1 Yes
- 2 No

A: Survey Instruments...

B13 Have you used some kind of financial analysis, such as calculation of payback periods or return on investment in setting equipment selections for these policies? (CIRCLE ONE NUMBER)

- 1 Yes
- 2 No

B14 Below is a list of statements about energy efficient investments or practices. For each statement, please use a 1 to 5 scale, with 1 meaning you completely disagree with the statement, and 5 meaning you completely agree with the statement. (CIRCLE ONE NUMBER FOR EACH STATEMENT)

	Completely Disagree			Completely Agree		
I believe my organization has already taken all cost-effective actions to reduce energy costs in this facility.	1	2	3	4	5	
When considering a new energy efficiency investment, I am concerned that the actual bill savings will be less than what was estimated.	1	2	3	4	5	
It takes too much time and hassle to get accurate information to make an informed decision about energy efficient investments.	1	2	3	4	5	
Lack of financing is a barrier to our organization in making energy efficiency investments.	1	2	3	4	5	
There are other important practical benefits besides saving money that come with energy efficient investments.	1	2	3	4	5	

B15 Thinking about both the equipment in your facility and the building itself, how would you rate the energy efficiency of your facility? Please use a 10 point scale, where 1 means not at all energy efficient and 10 means very energy efficient. (CIRCLE ONE NUMBER)

Not at all Energy Efficient											Very Energy Efficient
1	2	3	4	5	6	7	8	9	10		

B16 What do you feel is the main advantage of using high efficiency equipment at your facility? (CIRCLE ONE NUMBER)

- 1 Lower operating costs
- 2 Longer equipment life
- 3 Better performance
- 4 Lower energy use
- 5 Lower maintenance costs
- 6 Other [PLEASE DESCRIBE: _____]

B17 There are many reasons why a company might choose not to purchase high efficiency equipment. What is the main reason why your company would choose not to purchase high efficiency equipment? (CIRCLE ONE NUMBER)

- 1 Higher initial cost of efficient equipment
- 2 Too long a payback
- 3 Believe it is less reliable/doesn't perform as well
- 4 Efficient equipment not readily available
- 5 Efficient equipment not compatible in industrial process
- 6 Other [PLEASE DESCRIBE: _____]

A: Survey Instruments...

- B18 What additional support services would your staff need to increase your use of high efficiency equipment at this facility? *(FILL IN BLANK)*

- B19 Do you feel your company could increase your energy savings if your staff had access to information or more training on implementing energy efficiency improvements, or on the benefits and maintenance of high efficiency equipment? *(CIRCLE ONE NUMBER)*

- 1 Yes
2 No

(If yes) What specific types of information would you want? *(FILL IN BLANK)*

(If yes) What specific types of training would you want? *(FILL IN BLANK)*

Equipment/Technologies

- C1 Approximately what percentage of the enclosed square footage your organization occupies is usually heated in the winter? *(FILL IN BLANK)*

_____ %

- C2 About how old is your main heating system? *(FILL IN BLANK)*

_____ years

- C3 Approximately what percentage of the enclosed square footage your organization occupies is usually air conditioned during normal operating hours in the summer? *(FILL IN BLANK)*

_____ %

- C4 About how old is your main air conditioning system? *(FILL IN BLANK)*

_____ years

- C5 About how old is your main water heating system? *(FILL IN BLANK)*

_____ years

A: Survey Instruments...

- C6 How many of each of the following types of equipment do you use at this location? What is the average age of each type of equipment? *(FILL IN QUANTITY AND AGE FOR EACH TYPE OF EQUIPMENT. IF NONE, PLEASE PUT A ZERO IN QUANTITY)*

Equipment	Quantity	Age
Motors of 75 hp or less		
→How many motors 75 hp or less are variable speed drive?		
Motors over 75 hp		
→How many motors over 75 hp are variable speed drive?		
Air compressors		
Industrial refrigeration equipment [PLEASE DESCRIBE: _____]		
Industrial boilers		
Steam distribution systems		
Steam traps		
Ventilation equipment		
Commercial cooking equipment [PLEASE DESCRIBE: _____]		

- C7 What industrial process equipment or other important energy using equipment do you have at this facility? *(PLEASE DESCRIBE. THEN FILL IN QUANTITY AND AGE FOR EACH TYPE OF EQUIPMENT)*

Industrial process or other important energy using equipment	Quantity	Age

- C8 Does your firm have a computerized energy management system at this location?
(CIRCLE ONE NUMBER)

- 1 Yes
- 2 No (SKIP TO C10)

- C9 What is your energy management system used for? *(CIRCLE ONE NUMBER)*

- 1 Indoor lighting control
- 2 Outdoor lighting control
- 3 HVAC temperature control
- 4 Hot water control
- 5 Manufacturing process control
- 6 Control of overall electric demand charges
- 7 Other [PLEASE DESCRIBE: _____]

A: Survey Instruments...

C10 In the next 5 years, do you expect that your use of additional energy using equipment at this location will increase, decrease or stay about the same? *(CIRCLE ONE NUMBER)*

- 1 Increase→Why is that? _____
- 2 Decrease-→Why is that? _____
- 3 Stay about the same

C11 Please complete the following table regarding the energy consumption at this location. A reasonable approximation is acceptable.

In the first row, enter the total quantity of each energy type used last year at this location. *(ENTER ZERO IF NOT APPLICABLE)*

For the remaining rows, enter the percent of total energy consumption for each end use performed at this location. Complete each row (end use) for each energy type (column) consumed at this location. Complete one energy type for all end uses before starting the next energy type. *(ENTER ZERO IF NOT APPLICABLE. SUM OF EACH COLUMN SHOULD TOTAL 100%)*

	Electricity	Natural Gas	Propane/LP	Fuel Oil	Coal	Wood
Total Consumption	_____ kWh	_____ mcf	_____ gallons	_____ barrels	_____ short tons	_____ million Btu
End Use						
Boiler Fuel	%	%	%	%	%	%
Process Heating	%	%	%	%	%	%
Process Cooling & Refrigeration	%	%	%	%	%	%
Machine Drive	%	%	%	%	%	%
Electro-chemical Processes	%	N/A	N/A	N/A	N/A	N/A
Other Process Use	%	%	%	%	%	%
Heating, Cooling, and Air Conditioning	%	%	%	%	%	%
Lighting	%	N/A	N/A	N/A	N/A	N/A
Other Facility Support	%	%	%	%	%	%
Onsite Transportation (Non-Highway)	%	%	%	%	N/A	N/A
Electricity Generation	N/A	%	%	%	%	%
Total	100 %	100 %	100 %	100 %	100 %	100 %

- C12 Enter the quantity of electricity generated onsite at this location last year. Enter zero if not applicable. A reasonable approximation is acceptable. *(FILL IN BLANK)*

_____ kWh

Interest in IOF

The Maryland Industries of the Future (IOF) program will be conducting energy efficiency and management training for large energy-consuming industries such as yours. The IOF program is funded in part by the US Department of Energy and is sponsored by the Maryland Energy Administration. Its goal is to motivate and assist industry in developing technology solutions for critical energy, environmental, and economic challenges.

Through its BestPractices effort, the IOF program is developing a portfolio of reference material such as tip sheets, diagnostic software, case studies, training, and workshops in support of common plant technologies. Technologies currently supported by BestPractices include steam systems, motors, fans, pumps, compressed air, and process heating.

Through its Research and Development effort, the IOF is bringing together industry and university experts to develop new technologies and processes for industry. R&D projects are currently being developed within the chemicals industry. As the IOF program matures, program participants may have opportunities to be a part of R&D funding partnerships.

The IOF program offers opportunities for industrial facilities to conduct energy assessments. Through Industrial Assessment Centers, select Universities with engineering programs will provide industrial energy assessments free of charge to plants located within a 500-mile radius of their campus. Through the Plant Wide Assessment Program, DOE offers financial assistance to share the expense of energy assessments with participating industries.

- D1 How interested would your firm be in learning more about the State IOF program and its benefits? *(CIRCLE ONE NUMBER)*
- 1 Not interested
 - 2 Somewhat interested
 - 3 Very interested

- D2 Why did you express that level of interest? *(FILL IN BLANK)*

- D3 The Maryland Industries of the Future program is planning a Forum, tentatively scheduled for November 13, 2002. Would you be interested in receiving additional information about this forum? *(CIRCLE ONE NUMBER)*
- 1 Yes
 - 2 No

OVER =>

Respondent Information

E1 What is your title? (*CIRCLE ONE NUMBER*)

- 1 Chief Engineer
- 2 Energy Manager
- 3 Facility Manager
- 4 Operations Manager
- 5 Maintenance Supervisor
- 6 Plant Engineer
- 7 Plant Manager
- 8 Property Manager
- 9 Director of Operations, Manufacturing, Engineering
- 10 Vice-President of Operations
- 11 Maintenance Staff
- 12 Technician
- 13 Other [PLEASE DESCRIBE: _____]

E2 If you would like to receive additional information about the Industries of the Future program or the upcoming Forum, please help us update our contact information. Again, your responses to this survey will remain confidential. We request this information only so that we can send you more information on the program. Alternatively, if you would like to be removed from the IOF mailing list, please check the appropriate box (*FILL IN BLANKS OR CHECK BOX*)

Name: _____
Address: _____
City: _____
State & ZIP: _____
Phone: _____
Fax: _____
E-Mail: _____

☐ Please remove my name from the IOF mailing list

Thank you for your help with this important study!

Please return the completed survey using the enclosed envelope to:

Maryland Industries of the Future Survey
C/O PA Government Services
2711 Allen Blvd. Ste. 200
Middleton, WI 53562-9761

A.3 SURVEY MAP

Data Element	Variable Name	Question	Source	Survey Topic
1	ID	Harris ID	MD DBED	16. Other Business Characteristics
2	COMPANY	Company/Institution Name	MD DBED	1. Company Name
3	YEAR	Year Established	MD DBED	16. Other Business Characteristics
4	WEBADD	Web Address	MD DBED	16. Other Business Characteristics
5	CEO	Chief Executive Extended Info	MD DBED	16. Other Business Characteristics
6	MANAGER	Plant Management	MD DBED	16. Other Business Characteristics
7	MAILADD	Mail Address	MD DBED	5. Geographic Location
8	MAILCITY	Mail City	MD DBED	5. Geographic Location
9	MAILCNTY	Mail County	MD DBED	5. Geographic Location
10	MAILST	Mail State	MD DBED	5. Geographic Location
11	MAILZIP	Mail ZIP	MD DBED	5. Geographic Location
12	LOCADD	Local (Physical) Address	MD DBED	5. Geographic Location
13	LOCCITY	Local (Physical) City	MD DBED	5. Geographic Location
14	LOCST	Local (Physical) State	MD DBED	5. Geographic Location
15	LOCZIP	Local (Physical) ZIP	MD DBED	5. Geographic Location
16	FAX	Fax Number	MD DBED	16. Other Business Characteristics
17	PHONE	Phone Number	MD DBED	16. Other Business Characteristics
18	ACTSALES	Actual Sales Value (Parent Company)	MD DBED	3. Quantity of Product Manufactured
19	SALES	Sales Range (Local Site)	MD DBED	3. Quantity of Product Manufactured
20	EMPLOY_N	Employee Count, Now (Local Site)	MD DBED	4. Size of Facility (Employees and Area)
21	EMPLOY_P	Employee Count, Previous 3 Years (Local Site)	MD DBED	4. Size of Facility (Employees and Area)
22	SQFT	Plant Sq Ft	MD DBED	4. Size of Facility (Employees and Area)

A: Survey Instruments...

Data Element	Variable Name	Question	Source	Survey Topic
23	SIC	Primary SIC	MD DBED	2. Type of Product Manufactured
24	NAICS	Primary NAICS	MD DBED	2. Type of Product Manufactured
25	PRODUCT	Product Description	MD DBED	2. Type of Product Manufactured
26	A1	What is the principal activity conducted at this facility?	IOF Survey	2. Type of Product Manufactured
27	A2	What kinds of operations or processes occur at this location? What are the products made through these processes?	IOF Survey	6. Main Manufacturing Process & 7. Minor Manufacturing Processes
28	A3	What is the approximate annual revenue or sales of the products or services your organization provides at this location?	IOF Survey	3. Quantity of Product Manufactured
29	A4	What are your organization's total annual operating expenses at this location (including labor, rent, materials, and other overhead expenses)?	IOF Survey	16. Other Business Characteristics
30	A5	Does your firm occupy space in more than one building at this location?	IOF Survey	16. Other Business Characteristics
31	A6	Does your firm occupy the entire building(s) or just a portion of the building(s) at this location?	IOF Survey	16. Other Business Characteristics
32	A7	Does your firm . . . (Own, Lease, Both)?	IOF Survey	16. Other Business Characteristics
33	A8	What is the approximate total enclosed square footage of the building(s) you occupy at this address?	IOF Survey	4. Size of Facility (Employees and Area)
34	A9	What are you business's normal operating hours at this location?	IOF Survey	16. Other Business Characteristics
35	A10	How many shifts per day does your business normally operate at this location?	IOF Survey	16. Other Business Characteristics
36	A11	(If facility operates on multiple shifts) Is the same work performed on all shifts or do the functions vary with the time of day?	IOF Survey	16. Other Business Characteristics
37	A12	Approximately how many full-time employees work for your company at this location?	IOF Survey	4. Size of Facility (Employees and Area)

A: Survey Instruments...

Data Element	Variable Name	Question	Source	Survey Topic
38	A13	Approximately how many part-time and seasonal employees work for your company at this location?	IOF Survey	4. Size of Facility (Employees and Area)
39	A14	When was the building(s) you occupy at this facility built?	IOF Survey	16. Other Business Characteristics
40	A15	When did your company move into this building(s)?	IOF Survey	16. Other Business Characteristics
41	A16	(IF LEASE) Is your company billed directly for your electricity usage or is the bill paid by a landlord or property manager?	IOF Survey	16. Other Business Characteristics
42	A17	How many separate facilities does your company have nationwide <u>including this location?</u>	IOF Survey	16. Other Business Characteristics
43	A18	If your company was offered an opportunity to obtain electricity under a new contract, which of the following statements is true?	IOF Survey	16. Other Business Characteristics
44	B1	Is there a person, group or department in your organization that is assigned by top management to manage energy use and costs?	IOF Survey	10. Energy Efficiency Experience
45	B2	Is there an annual budget assigned to energy management activities?	IOF Survey	10. Energy Efficiency Experience
46	B3	Does your company have energy cost reduction goals?	IOF Survey	10. Energy Efficiency Experience
47	B4A	Are there persons in your organization who have been assigned responsibility for tracking energy use or costs over time for the facility as a whole?	IOF Survey	10. Energy Efficiency Experience
48	B4B	Are there persons in your organization who have been assigned responsibility for monitoring energy use for key building or process systems?	IOF Survey	10. Energy Efficiency Experience
49	B4C	Are there persons in your organization who have been assigned responsibility for identifying facility improvements to reduce energy use and costs?	IOF Survey	10. Energy Efficiency Experience
50	B4D	Are there persons in your organization who have been assigned responsibility for qualifying potential energy efficiency improvements in terms of costs and returns on investment?	IOF Survey	10. Energy Efficiency Experience

A: Survey Instruments...

Data Element	Variable Name	Question	Source	Survey Topic
51	B4E	Are there persons in your organization who have been assigned responsibility for controlling or reducing peak electrical demand for the facility?	IOF Survey	10. Energy Efficiency Experience
52	B4F	Are there persons in your organization who have been assigned responsibility for controlling or reducing peak electrical demand for specific buildings and equipment?	IOF Survey	10. Energy Efficiency Experience
53	B5	(IF NO TO ALL IN B4) What is the MAIN reason you company has not assigned staff to energy management activities?	IOF Survey	10. Energy Efficiency Experience
54	B6	How many years has it been since your organization has conducted a complete energy audit at this facility?	IOF Survey	10. Energy Efficiency Experience
55	B7	In the past two years, how many major renovations, additions or remodeling at this location involving expenditures of \$10,000 or more for a single project has your organization undertaken at this facility?	IOF Survey	10. Energy Efficiency Experience
56	B8	[Was this project/Were any of these projects] undertaken with the primary objective of reducing energy costs in the facility?	IOF Survey	10. Energy Efficiency Experience
57	B9	Who is responsible for recommending and approving equipment purchases? What limitations (equipment type or dollar amount) are placed on this approval authority?	IOF Survey	10. Energy Efficiency Experience
58	B10	Which of the following best describes your organization's policy regarding the purchase of energy using products?	IOF Survey	10. Energy Efficiency Experience
59	B11	Is this policy . . . (Formal, Informal, Both)?	IOF Survey	10. Energy Efficiency Experience
60	B12	Does this policy mention Energy Star labeled equipment?	IOF Survey	10. Energy Efficiency Experience
61	B13	Have you used some kind of financial analysis, such as calculation of payback periods or return on investment in setting equipment selections for these policies?	IOF Survey	10. Energy Efficiency Experience

A: Survey Instruments...

Data Element	Variable Name	Question	Source	Survey Topic
62	B14A	I believe my organization has already taken all cost-effective actions to reduce energy costs in this facility.	IOF Survey	10. Energy Efficiency Experience
63	B14B	When considering a new energy efficiency investment, I am concerned that the actual bill savings will be less than what was estimated.	IOF Survey	10. Energy Efficiency Experience
64	B14C	It takes too much time and hassle to get accurate information to make an informed decision about energy efficient investments.	IOF Survey	10. Energy Efficiency Experience
65	B14D	Lack of financing is a barrier to our organization in making energy efficiency investments.	IOF Survey	10. Energy Efficiency Experience
66	B14E	There are other important practical benefits besides saving money that come with energy efficient investments.	IOF Survey	10. Energy Efficiency Experience
67	B15	Thinking about both the equipment in your facility and the building itself, how would you rate the energy efficiency of your facility?	IOF Survey	10. Energy Efficiency Experience
68	B16	What do you feel are the main advantages of using high efficiency equipment at your facility?	IOF Survey	10. Energy Efficiency Experience
69	B17	There are many reasons why a company might choose not to purchase high efficiency equipment. What are some of the reasons why your company would choose not to purchase high efficiency equipment?	IOF Survey	10. Energy Efficiency Experience
70	B18	What additional support services would your staff need to increase your use of high efficiency equipment at this facility?	IOF Survey	11. Training Needs & Desires
71	B19	Do you feel your company could increase your use of high efficiency equipment if your staff had access to information or more training on the benefits and maintenance of high efficiency equipment? What specific types of information and training would you want?	IOF Survey	11. Training Needs & Desires
72	B19A	(If Yes) What specific types of information would you want?	IOF Survey	11. Training Needs & Desires
73	B19B	(If Yes) What specific types of training would you want?	IOF Survey	11. Training Needs & Desires

A: Survey Instruments...

Data Element	Variable Name	Question	Source	Survey Topic
74	C1	Approximately what percentage of the enclosed square footage your organization occupies is usually heated in the winter?	IOF Survey	13. Energy Use by Fuel & End-Use
75	C2	About how old is your main heating system?	IOF Survey	9. Age of Equipment Used
76	C3	Approximately what percentage of the enclosed square footage your organization occupies is usually air conditioned during normal operating hours in the summer?	IOF Survey	13. Energy Use by Fuel & End-Use
77	C4	About how old is your main air conditioning system?	IOF Survey	9. Age of Equipment Used
78	C5	About how old is your main water heating system?	IOF Survey	9. Age of Equipment Used
79	C6A	How many and how old -- Motors of 75 hp or less-How many are variable speed drive?	IOF Survey	8. Major Equipment & Technology Used
80	C6B	How many and how old -- Motors over 75 hp-How many are variable speed drive?	IOF Survey	8. Major Equipment & Technology Used
81	C6C	How many and how old -- Air compressors	IOF Survey	8. Major Equipment & Technology Used
82	C6D	How many and how old -- Industrial refrigeration equipment	IOF Survey	8. Major Equipment & Technology Used
83	C6E	How many and how old -- Industrial boilers	IOF Survey	8. Major Equipment & Technology Used
84	C6F	How many and how old -- Steam distribution systems	IOF Survey	8. Major Equipment & Technology Used
85	C6G	How many and how old -- Steam traps	IOF Survey	8. Major Equipment & Technology Used
86	C6H	How many and how old -- Ventilation equipment	IOF Survey	8. Major Equipment & Technology Used
87	C6I	How many and how old -- Commercial cooking equipment [SPECIFY: _____]	IOF Survey	8. Major Equipment & Technology Used
88	C7	How many and how old -- Industrial process and other energy using equipment	IOF Survey	8. Major Equipment & Technology Used
89	C8	Does your firm have a computerized energy management system at this location?	IOF Survey	8. Major Equipment & Technology Used

A: Survey Instruments...

Data Element	Variable Name	Question	Source	Survey Topic
90	C9	What is your energy management system used for?	IOF Survey	8. Major Equipment & Technology Used
91	C10	In the next 5 years, do you expect that your use of additional energy using equipment at this location will increase, decrease or stay about the same?	IOF Survey	12. Future Industry Trends
92	C11	For each of the following energy types, enter the total quantity used at this location last year. Then enter the percent of total consumption for each end use performed at this location	IOF Survey	13. Energy Use by Fuel & End-Use
93	C12	Enter the quantity of electricity generated onsite at this location last year.	IOF Survey	13. Energy Use by Fuel & End-Use
94	D1	How interested would your firm be in learning more about the State IOF program and its benefits?	IOF Survey	Interest in IOF (may lead to 15. Willingness to Take the Lead as State IOF Champion)
95	D2	Why did you express that level of interest?	IOF Survey	Interest in IOF (may lead to 15. Willingness to Take the Lead as State IOF Champion)
96	D3	Would you be interested in receiving additional information about the forum?	IOF Survey	Interest in IOF (may lead to 15. Willingness to Take the Lead as State IOF Champion)
97	E1	What is your title?	IOF Survey	16. Other Business Characteristics
98	E2	Contact Information or Opt-Out of mailing list	IOF Survey	16. Other Business Characteristics
99	EI	Calculated by dividing results of C11 (Amount of Energy by Source) by A3 (Revenue), by A8 (Sq Ft), and by A12 (Full-time employees). C11 (Consumption by End-Use) can also be included to calculate end-use intensities	Calculated Field	14. Energy Intensity

A.4 TELEPHONE SCREENING SCRIPT

Introduction to receptionist

Hello. This is _____ calling from PA Government Services. We are a professional research and consulting firm working on behalf of the Maryland Energy Administration. **THIS IS NOT A SALES CALL.**

May I please speak with a person such as the facility manager, chief engineer, operations manager, or maintenance manager who would be most knowledgeable about decisions affecting your energy using equipment at **LOCATION**?

Before being connected

In a few days, we will be mailing this person a survey and I would like to make sure I have the contact information correct.

1. May I please have their **NAME**?
2. What is their **TITLE**?
3. What is the best **PHONE NUMBER** at which to reach them?
4. Confirm **MAIL ADDRESS**.
5. Would you please connect me?

After being connected (person or voice mail)

Hello. This is _____ calling from PA Government Services. We are a professional research and consulting firm working on behalf of the Maryland Energy Administration. **THIS IS NOT A SALES CALL.**

The U.S. Department of Energy's Industrial Technologies program is working with the Maryland Energy Administration and other state partners on energy-focused research that is critical to Maryland's economy. This is an important study on the energy needs and perceptions of industrial firms in the state, and how firms like yours think about and manage energy costs.

(IF CONNECTED TO VOICE MAIL, SKIP TO CONCLUSION)

As part of this study, we would like to mail a survey to the person who is most knowledgeable about decisions affecting your energy using equipment at **LOCATION**.

6. Are you the person who is most knowledgeable about your organization's energy operations at this location?

No – Repeat Questions 1-5

Yes – Confirm **NAME, TITLE, PHONE NUMBER, and MAIL ADDRESS**

Conclusion

In a few days, you will be receiving a survey in the mail, along with a cover letter from the Maryland Energy Administration and a stamped return envelope. It should only take about 15 minutes to complete. We appreciate your assistance with this important study.

If concerned about confidentiality

You can be assured that the results of this survey will remain confidential with the Maryland Energy Administration. Individual-level data will not be reported. Data will be aggregated to the industrial sector level. Sector-level data will only be reported if 5 or more establishments from the same sector respond to the survey.

Other concerns

If they have any questions about the purpose of the study or its use, they can call Charles Miller at (410) 260-7190. If they have any questions about completing the survey and would like to call PA Government Services, they can call Bryan Zent at (608) 827-7820.

A.5 TELEPHONE FOLLOW-UP SCRIPT

Introduction to receptionist

Hello. This is _____ calling from PA Government Services. We are a professional research and consulting firm working on behalf of the Maryland Energy Administration. THIS IS NOT A SALES CALL.

May I please speak with **NAME**?

If asked about purpose of the call

I would like to follow-up on a survey we mailed to **NAME** several weeks ago.

If NAME is missing

May I please speak with a person such as the facility manager, chief engineer, operations manager, or maintenance manager who would be most knowledgeable about decisions affecting your energy using equipment at **LOCATION**?

Before being connected

In a few days, we will be mailing this person a survey and I would like to make sure I have the contact information correct.

1. May I please have their **NAME**?
2. What is their **TITLE**?
3. What is the best **PHONE NUMBER** at which to reach them?
4. Confirm **MAIL ADDRESS**.
5. Would you please connect me?

After being connected (person or voice mail)

Hello. This is _____ calling from PA Government Services. We are a professional research and consulting firm working on behalf of the Maryland Energy Administration. THIS IS NOT A SALES CALL.

The U.S. Department of Energy's Industrial Technologies program is working with the Maryland Energy Administration and other state partners on energy-focused research that is critical to Maryland's economy. This is an important study on the energy needs and perceptions of industrial firms in the state, and how firms like yours think about and manage energy costs.

Several weeks ago, we mailed a survey to you as part of this study. Your input is very important. If you have about 15 minutes, I would like to go through the survey with you over the phone.

(IF CONNECTED TO VOICE MAIL, "I will call you back later this week. In the meantime, if you would like to call at time more convenient to you, I can be reached at 608-827-7820." End Call.)

Is now a good time? If no, get call-back time, otherwise:

6. Are you the person who is most knowledgeable about your organization's energy operations at **LOCATION**?

No – Repeat questions 1-5

Yes – Continue with survey

If concerned about confidentiality

You can be assured that the results of this survey will remain confidential with the Maryland Energy Administration. Individual-level data will not be reported. Data will be aggregated to the industrial sector level. Sector-level data will only be reported if 5 or more establishments from the same sector respond to the survey.

Other concerns

If they have any questions about the purpose of the study or its use, they can call Charles Miller at (410) 260-7190. If they have any questions about completing the survey and would like to call PA Government Services, they can call Bryan Zent at (608) 827-7820.

A.6 TELEPHONE ON-SITE VISIT RECRUITING SCRIPT

Introduction to receptionist

Hello. This is _____ calling from PA Government Services. We are a professional research and consulting firm working on behalf of the Maryland Energy Administration. THIS IS NOT A SALES CALL.

May I please speak with **NAME**?

If asked about purpose of the call

I would like to follow-up on a survey we mailed to **NAME** several weeks ago.

If NAME is missing

May I please speak with a person such as the facility manager, chief engineer, operations manager, or maintenance manager who would be most knowledgeable about decisions affecting your energy using equipment at **LOCATION**?

Before being connected

In a few days, we will be mailing this person a survey and I would like to make sure I have the contact information correct.

1. May I please have their **NAME**?
2. What is their **TITLE**?
3. What is the best **PHONE NUMBER** at which to reach them?
4. Confirm **MAIL ADDRESS**.
5. Would you please connect me?

After being connected (person or voice mail)

Hello. This is _____ calling from PA Government Services. We are a professional research and consulting firm working on behalf of the Maryland Energy Administration. THIS IS NOT A SALES CALL.

Are you the person who is most knowledgeable about your organization's energy operations at **LOCATION**?

No – Get **NAME**, **TITLE**, and **PHONE NUMBER**; Ask to be connected

Yes – Continue

The U.S. Department of Energy's Industrial Technologies program is working with the Maryland Energy Administration and other state partners on energy-focused research that is critical to Maryland's economy. This is an important study on the energy needs and perceptions of industrial firms in the state, and how firms like yours think about and manage energy costs.

You should have received a survey in your mailbox several weeks ago. This survey was part of the first phase of the assessment study. The assessment study has now entered its second phase. PA's team of energy efficiency experts will be conducting on-site visits of industrial firms. During these visits, the team will collect additional data with the survey and conduct plant walk-throughs to help us understand the energy issues faced by companies such as yours. At the same time, this is an opportunity for you to learn from our experts the

energy-saving steps being taken by companies like yours. On-site visits are currently being scheduled for **October 3 and 4**, at approximately 8:30, 11:30, and 2:30 each day. We anticipate that the visit should take about 1 _ to 2 hours. If you have already completed the survey, the visit will be shorter. Would you be interested in participating in an on-site visit?

If yes, get **DATE/TIME SLOT, NAME, DIRECT PHONE NUMBER, FULL ADDRESS, and ANY SPECIAL INSTRUCTIONS**

(IF CONNECTED TO VOICE MAIL, "I will call you back later this week. In the meantime, if you would like to call at time more convenient to you, I can be reached at 608-827-7820." End Call.)

If concerned about confidentiality

You can be assured that the results of this survey will remain confidential with the Maryland Energy Administration. Individual-level data will not be reported. Data will be aggregated to the industrial sector level. Sector-level data will only be reported if 5 or more establishments from the same sector respond to the survey.

Other concerns

If they have any questions about the purpose of the study or its use, they can call Charles Miller at (410) 260-7190. If they have any questions about completing the survey and would like to call PA Government Services, they can call Bryan Zent at (608) 827-7820.